Value-based Healthcare

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Chapter 1: Authentic leadership for value-based healthcare

Richard Olley and Tracey Silvester

Source: Matteo Vistocco on Unsplash

This chapter describes the importance of leadership in implementing value-based healthcare through authentic leadership principles. It discusses definitions, contemporary literature on the topic, and the change management implications that need to be considered by leaders, who have a very important role in supporting value-based healthcare. Talent management principles and techniques in the form

of recruiting and selecting the right leaders and their team members to achieve the objectives of value-based healthcare are described and applied via some case scenarios, and the key implications for leadership practice are identified and discussed.

There are activities and reflections for you to engage with in this chapter. You can create a journal to record these to aid your learning.

CHAPTER STRUCTURE

This chapter will cover the following topics:

- Introducing value-based healthcare
- Background to value-based healthcare
- Components of value-based healthcare
- Leadership
- Authentic leadership principles
- Implications for practice

1.1 Introducing value-based healthcare

As an important and contemporary strategy, value-based healthcare operates on a sound evidence base and is a person-centred or consumer-centric approach that supports clinical decisions and governance to deliver value for patients in the form of health outcomes achieved per dollar spent (Porter & Teisberg, 2006). The approach requires significant system transformation, meaning change management and quality and safety considerations become of primary importance, along with ensuring that the evidence is available, supported and acted upon in any implementation scenario. Value-based healthcare aims to create better health outcomes with improved healthcare consumer experiences via planned care pathways that enhance the experience for health professionals providing the care and the general population served.

Value-based healthcare focuses on improving healthcare quality and safety for consumers (Dombradi et al, 2021) and preventing problems before they begin. Many value-based healthcare initiatives are conducted globally and in Australia, primarily focusing on acute healthcare settings. This leaves significant scope for implementation in other areas of the health and social care systems, including mental health, disability, aged care and community-based care. What seems problematic is that value-based healthcare requires coordination of effort and resources to achieve high-quality healthcare with outcomes acceptable to the consumer and clinicians.

An integrated team approach is inherent to robust value-based care models. The National Academy of Medicine defines team-based care as:

The provision of health services to individuals, families, or their communities by at least two health providers who work collaboratively with patients and their caregivers to the extent preferred by each patient to accomplish shared goals within and across settings to achieve coordinated, high-quality care. (Smith et al., 2018)

The team approach to care is linked to improved healthcare consumer outcomes and may also be a means to improve the wellbeing of the healthcare staff who provide the care (Welp & Manser, 2016). As care becomes increasingly complex and workforce availability becomes less assured, there are concerns that increased fragmentation will prevent the benefits of integrated care from being realised for consumers (Peikes et al., 2014).

VIDEO: WHAT IS VALUE-BASED HEALTHCARE?

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://oercollective.caul.edu.au/value-based-health-care/?p=5#oembed-1

Source: Australian Healthcare and Hospitals Association (3 minutes)

ACTIVITY

After watching the video, answer the following questions in the journal that you created for reading this chapter.

1. Reflect on how value-based healthcare could be applied in your own healthcare experience. Consider a time when you or someone close to you received healthcare services. How might the focus on value, defined by improved health outcomes relative to cost, have altered the experience or outcome?
2. The formula quoted in the video $\text{Value} = \frac{\text{Outcomes of care}}{\text{Cost}}$ presents some challenges to calculate.
3. How would you track health consumer outcomes AND their experiences, and how would you add monetary value to them?
4. Where would you find the data sources for your proposal?
5. The video also mentions the calculation of direct and indirect costs. Tracking direct costs through the general ledger is a relatively easy reporting exercise in a modern health information system; however, how would you consider the indirect costs to the consumer?

1.2 Background to value-based healthcare

One of the more important benefits of value-based healthcare is that it is associated with improved consumer satisfaction, and the evidence points to a real reduction in costs of care provision, reduced medical errors and improved health consumer satisfaction and clinical outcomes. Before exploring the important benefits of value-based healthcare, let's examine some definitions and review available and well-subscribed theories and models.

Definition

Value-based healthcare is a delivery model for healthcare where healthcare services and individual providers are remunerated based on the consumer outcomes. The value-based healthcare model requires formal agreement with providers regarding paying providers when healthcare consumers improve their health status, when the incidence of chronic disease is reduced in the population, and when health status is improved by applying evidence-based principles to treatments and care. Value-based healthcare significantly differs from funding models such as capitation or fee-for-service, where providers are remunerated based on the volume of care delivered regardless of outcomes. Value-based healthcare is assessed by measuring the health outcomes achieved against the costs associated with achieving treatment and care outcomes.

Underpinning theory

The theories that underpin value-based healthcare come from agency theory and behavioural economics (Conrad, 2015). Conrad found these two theories had powerful implications for the design of payment systems. His review of original literature combined with applied research and empirical evidence on the application of those principles to the payment for value-based healthcare led him to the conclusion that payment contracts are 'incentive capable' and encourage better care at reduced costs, mitigate gaming of the health payment system and induce efficient and effective providers to participate (Conrad, 2015).

Benefits

The benefits of value-based care are lower costs, higher patient satisfaction, reduced clinical errors and better-informed patients. However, a recent scoping review of the literature by van Staalduinen and colleagues related to the implementation of value-based healthcare revealed that, after review, 62 out of 1,729 records returned in a literature search concentrated on the goals or the value for money of value-based healthcare. The review continued by identifying that none of the papers conceptualised

value-based healthcare, and most did not specify how it was conceptualised in the first place (van Staalduinen et al., 2022). These researchers found that most studies concentrated on measuring outcomes and costs and failed to evaluate the effectiveness of the approach described, while few studies described the implementation strategies they used (van Staalduinen et al., 2022).

1.3 Components of value-based healthcare

Measuring health outcomes and costs

Outcome measures reflect the impact of the healthcare service or intervention on the health status of healthcare consumers. Clinical outcomes are measured by activity data such as hospital readmission rates, agreed scales and other measurement forms. Health outcome data is recorded by clinical staff such as doctors, nurses and allied health professionals with the help of health information managers as required.

The aim of measuring outcomes can be diverse because it must be viewed through the lens of the consumer in value-based healthcare and includes guiding clinical decision-making, initiating improvement interventions, benchmarking, monitoring, scientific research and, importantly, public accountability. An outcome measure is a tool used to assess a healthcare consumer's current health status. It may provide a score, an interpretation of results and, at times, a risk categorisation of the healthcare consumer. Before delivering any intervention, an outcome measure provides baseline data.

The Centers for Disease Control and Prevention's 'Healthy Days Measures' assesses four key domains: self-rated general health, physical health, mental health and activity limitations. These domains provide a good set to start outcomes measurement, and others are used to varying degrees of success.

Cost measurement is always a contested terrain. There are traditional ways of paying providers of healthcare. Follow each of the links to learn more about each method:

1. Fee-for-service (FFS)
2. Salary and wages for services
3. Global budget
4. Activity-related payments such as diagnosis-related groups
5. Capitation
6. Pay-for-performance
7. Bundled payments

This list represents the more common methods, and you may come across more as you undertake further reading on this important health leadership topic.

The last three on the list are often associated with a value-based healthcare approach.

FURTHER READING

Professor Henry Cutler provides some excellent explanations from an Australian perspective in the following issues brief.

A roadmap towards scalable value-based payments in Australian healthcare

Deeble Institute for Health Policy Research, Issues Brief no. 49, 6 December 2022

Quality and safety considerations

Credible research and lived experiences related to quality and safety provide a foundation for the requisite evidence-based practice in healthcare and other services offered to individuals. Quality and safety processes identify necessary changes to improve clinical practice and health outcomes. They also help reduce risks and harm associated with care delivery. Australia is fortunate to have the Australian Safety and Quality Framework for Healthcare, which specifies three principles for safe, high-quality, consumer-centric care driven by information and organised for safety. The evidence suggests that there are important considerations when improving the safety and quality of care provided. The following are some strategies to consider when thinking about how a leader can enhance the quality and safety of care.

Minimising variation from standard procedures during care

Substantial variation in healthcare outcomes or processes is an alarm bell that should make us stop and investigate whether appropriate care is being delivered. Variation is not necessarily bad; when it reflects differences in health consumers' needs, it can indicate high-quality healthcare (Australian Commission on Quality and Safety in Health Care, 2023).

Leading teams with effective task management

There are various skills that a leader exhibits for effective task management. Managing tasks effectively requires the leader to set priorities and triage tasks according to their criticality. Most team members' work times centre on undertaking certain tasks successfully. These tasks might be repetitive or one-off, and the leader must inform team members of their priority among many functions that all seem like high-priority tasks (Shafique et al., 2020). To be effective, leaders must balance the workload and the time management skills of those on their teams when delegating tasks (Racy et al., 2021).

Using advanced communication and listening skills to support effective task management

Another skill essential to effective task management is active listening, which helps the leader build strong relationships, makes team members feel heard and understood and helps to build trust because team members feel they have a voice and perceive the leader as authentic (Olley, 2022).

Improving care coordination and patient flow between departments or services

There is considerable evidence that value-based healthcare focuses clinicians on improving patient flow, thus helping to achieve timely and optimal care by forming a leadership structure and selecting conditions to be treated using value-based healthcare principles (Hernandez et al., 2019), adding patient wellness in a value-based healthcare framework (Goretti et al., 2020), clinical outcome improvement (Ackerman et al., 2019; Danilyants et al., 2019; Glotzbach et al., 2018), patient-reported improvement (Ahn et al., 2019; Colegate-Stone et al., 2016; van Egdom et al., 2019) and achieving optimal health outcomes (Goretti et al., 2020; Hernandez et al., 2019; Parker et al., 2017; Thaker et al., 2016). These initiatives reported in evidence related to the implementation of value-based healthcare help with timely care, achieving patient satisfaction with care outcomes, decreasing the length of stay and reducing the cost of care while achieving high-quality care.

Expanding partnerships

Partnering with patients in their care is an important component of person-centred care because of the focus on the relationship between the clinician and the patient, with trust, mutual respect and knowledge sharing required for the best health outcomes (Australian Commission on Quality and Safety in Health Care, 2024; Stevenson & Kaafarani, 2011). Other partnerships are also important in value-based healthcare for collaboration, innovation and cost-effectiveness. Healthcare providers form these partnerships with shared values and a common vision for what can be achieved on behalf of and with the patient. These partnerships might be with a transitional care provider to optimise discharge planning and bed-day utilisation, diagnostic services providers, community care organisations or partnerships forming integrated care networks. Value-based healthcare requires these partnerships to be developed, nurtured and evaluated.

These quality and safety considerations rely on leadership to plan and implement them, and healthcare leaders must understand and embrace them and lead their teams to success ethically and authentically.

1.4 Leadership response

Value-based healthcare is a model of care that encourages clinicians and healthcare organisations to deliver high-quality and cost-effective healthcare. However, for value-based healthcare to be successful, a committed and competent leadership response is required. The following areas are very important in the leadership response.

Aligning incentives for providers and organisations

Workforce initiatives such as properly designed remuneration schemes and fair performance measures must be implemented. These systems must have some reward value, which means more than agreeing on volumes of services.

Several initiatives in this regard can be assessed for useability and viability. These include:

- Pay-for-performance schemes
- Bundled payments
- Capitation models
- Bonus or shared savings models that seek to associate payments with quality and safety measures, not just economic measures. These are particularly useful for healthcare providers who are essentially small business owners rather than fully employed on a salary within the healthcare system. The incentives can be offered to partners in the care, such as diagnostic services or home-based or community services that create integrated care networks as described above.

Basing decision-making on valid and reliable data

Decision-making in value-based healthcare involves aligning decisions with valid and reliable data to improve healthcare outcomes. Increasingly, healthcare providers use data to monitor healthcare outcomes, identify improvements and measure intervention impacts. Decisions should consider short-term and long-term gains and implications. Decisions should also align with the organisation's principles, values, identity and aspirations.

Openness to creativity and innovation

Providers must be open to developing creativity and innovation in every aspect of the healthcare delivery system, and this is particularly important in value-based healthcare. In this context,

creativity relates to the decision-maker's ability to create something new and valuable, and **innovation** relates to improved healthcare product services. Stevenson and Kaafarani (2011) assert that creativity and innovation bring change to an organisation and that leaders must understand both concepts and the value of each to be successful. Innovative leaders possess transformative thinking, are open-minded and are risk-aware rather than risk-averse. Innovative leaders empower their teams to adapt to changing healthcare requirements and contemporary evidence and to aspire to the highest quality of care and services. To foster a culture of creativity, leaders should lead by example, encourage diverse teams, provide training and development, reward and recognise innovation, and promote cross-functional collaboration.

Open communication with patients and families

In value-based healthcare, open communication with patients and their families promotes engagement, which is important in achieving a high-performing healthcare system because it leaves the way open for co-design of the healthcare (Kohler et al., 2017). Open communication significantly improves collaboration between parties and promotes openness to creativity and innovation, as described above.

Leadership and teamwork

Demonstrating leadership and fostering teamwork is essential to effectively implementing a value-based healthcare approach. Cornell explains this well in their analysis of historical and current leadership theories, in which they incorporate components of several theories into 'a more versatile and novel healthcare leadership model' (Cornell, 2020). It is generally agreed that communication, collaboration and teamwork are essential in providing quality healthcare, especially when considering patient outcomes, preventing clinical and non-clinical errors, and improving efficiency. It is also well documented that effective leadership increases consumer and health team member satisfaction.

Recruiting, selecting and developing the right people

Hiring the right people is crucial to any enterprise's success, and a body of evidence concerning value-based recruitment is emerging. While this is not a new talent acquisition and management approach, there is an emerging understanding of cultural fit within a team. Candidates' values and beliefs drive behaviour and are increasingly perceived as vital components in recruitment.

FURTHER READING

Skills for Care published a seminal report on research into the impact of a values-based approach to recruitment and retention and explored ways to embed values throughout the recruitment process.

What is values-based recruitment?

Skills for Care (2024)

1.5 Authentic leadership principles

The literature demonstrates an increasing interest in developing leaders who abandon self-interest while improving employees' experiences and organisational performance (George, 2004; Boyatzis & McKee, 2005). The **servant leadership** approach epitomises this doctrine. Servant leadership focuses on accomplishing shared visions and goals by developing employees to their potential. Servant leadership promotes greater leader self-awareness, an internalised moral perspective, balanced processing of information and relational transparency of leaders working with followers to foster positive self-development (Walumbwa et al., 2007). Servant leadership stems from relying on the primary desire to serve (Russell, 2001; Block, 2013; Covey, 1992; Greenleaf, 1991).

Although there is agreement on the basic concept of servant leadership, the characteristics and behaviours of servant leadership in the literature are indeterminate and ambiguous (Russell & Stone, 2002). Servant leaders are motivated by the needs of others over self-interest. They place themselves as servants in their relationship with their followers (Greenleaf, 1991; Pollard, 1996). This mindset is quite different from traditional leadership approaches. Servant leadership emphasises personal integrity and long-term relationships with employees outside the organisation, serving whole communities and society (Liden et al., 2008). The dominant influence of servant leadership results from favourable relationships and referent power built on subordinate trust, loyalty, respect and satisfaction, derived from an employee-centred culture established by servant leaders (Rachmawati & Lantu, 2014). Servant leaders shift authority to followers; therefore, they are non-reliant on formal or institutional power to achieve outcomes. Servant leaders also positively affect the least privileged in society; they want to understand whether followers will benefit or, at least, will not be further deprived. If inequalities and social injustices exist, a servant leader tries to remove them (Graham, 2015).

Servant leadership

Authentic leadership falls within the servant leadership category. Historically, authentic leadership theory was founded in ancient Greek philosophy, which emphasised that authenticity is a construct that embodies being in control of one's life through the Delphic maxim of 'know thyself' (Novicevic et al., 2016). Authentic leadership in the literature of the 1960s came to describe how an organisation reflects itself authentically through leadership (Gardner et al., 2011).

The literature describes authentic leadership as behaviour that defines the leadership role within an organisation (Seeman, 1966). Others argue that it applies to the entire organisation, meaning that all in the organisation behave authentically as if they were a single entity through their responses to responsibility ascribed within the organisation or their reactions to uncertainty and innate creativity

(van Aken, 2016). Authentic leaders are mission-driven (George, 2004). Further, authentic leaders are persuasive in asserting that they create greater value than those more financially oriented (George & Sims, 2007).

Dimensions of authentic leadership

According to George, a leader authentically emphasises building legitimacy through honest relationships and ethical actions that, in turn, maximise the efforts of others to achieve the goal. There are **five dimensions** of authentic leaders (George, 2004):

1. Pursue and display **purpose and direction** with a passion so people want to follow and thus show the purpose of leadership.
2. **Practice solid values**. If one is not perceived to have integrity, there will be no basis for trust, adversely affecting followership.
3. Authentic leaders are said to **'lead with the heart'** and engage the hearts of those they serve, and therefore, align their interests with those they lead. An authentic leader requires empathy and compassion for the people they work with and the courage to make difficult decisions.
4. Authentic leaders establish **enduring relationships** built on connectedness and a shared purpose of working together towards a common goal.
5. **Self-discipline** is a key behaviour of authentic leaders to produce results. Authentic leaders take full responsibility for outcomes and hold others accountable for their performance. (George, 2004)

Characteristics of authentic leaders

George and Sims refined their description of authentic leaders' behaviour to be consistent with personality and core values (George & Sims, 2007) of honesty, ethics and practicality (George et al., 2007). An analysis of contemporary literature produces **five characteristics** of authentic leaders:

1. They emphasise **building the leader's legitimacy through honest relationships with followers** with a sense of purpose, knowing what they are about and where they are headed (Northouse, 2019).
2. They **value followers' input**, built on an ethical foundation (George & Sims, 2007).
3. They are **positive and truthful**, promote openness, and build trust with followers (Farid et al., 2020).
4. They have a **purpose** which manifests as **passion**. Passionate people are interested in what they are doing, are inspired and intrinsically motivated, and care about their work

(Northouse, 2019).

5. They generate enthusiastic support from followers to **improve individual and team performance** (Thacker, 2016).

For each of the dimensions of authentic leadership, related characteristics need to be evident for a leader to be effective. Authentic leaders live their values, which is important as others determine a leader's value through their behaviour. They help others see their work's value and deeper purpose and create enduring and genuine relationships through connections. Importantly, authentic leaders convert their values into consistent actions on which others can rely.

The characteristics described above mean that authentic leaders display **self-awareness**, which is the ongoing process of reflection and re-examination of personal strengths, weaknesses and values, signifying that the leader does not stray from their core beliefs. Authentic leaders subscribe to **relational transparency,** which is the open sharing of their thoughts and beliefs balanced by a minimal exhibition of inappropriate emotions. Moreover, authentic leaders practice **balanced processing,** which is related to actively seeking opposing viewpoints and giving them fair consideration. They have an **internalised moral perspective** where the leader adheres to a positive ethical foundation in relationships and decisions and is resistant to outside pressures (George & Sims, 2007; Northouse, 2019; Walumbwa et al., 2011).

ACTIVITY

The following videos are three examples of discussions or webinars on value-based healthcare. They vary in length, so examine the time you have to view them in full.

VIDEO: VALUE-BASED HEALTH CARE – AUSTRALIAN DEVELOPMENTS AND OPPORTUNITIES FOR PUBLIC HOSPITAL

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://oercollective.caul.edu.au/value-based-health-care/?p=72#oembed-1

Source: Independent Health and Aged Care Pricing Authority (IHACPA) (11 minutes)

REFLECTION

Reflect on Porter's value-based healthcare framework. Familiarise yourself with the key components of the framework: health outcomes that matter to patients, the cost of delivering these outcomes, integrated care and a strong focus on patient-centredness.

Reflecting on the current state of value-based healthcare implementation in Australia, what are the most significant barriers at the national and state levels that hinder the transition from innovative models of care to their mainstreaming in the public healthcare system?
Specifically, address the challenges posed by different funding regimes and rules across various sectors (hospital, aged care, primary care, disability care, social care) and the issue of clinical variation.
Discuss how the observed trends in activity-based management capabilities, including their rise and potential decline, impact the implementation of value-based healthcare. What strategies could be used to overcome these barriers and ensure a more cohesive and effective adoption of value-based healthcare principles across different healthcare sectors?

VIDEO: ALLIED HEALTH LEADERSHIP IN VBHC TRANSITION – QLD HEALTH ALLIED HEALTH FRAMEWORK FOR VBHC

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://oercollective.caul.edu.au/value-based-health-care/?p=72#oembed-2

Source: Australian Healthcare and Hospitals Association (53 minutes)

REFLECTION

Reflecting on the webinar about the value-based healthcare framework in Queensland and its focus on allied health, consider the following:

1. **Patient-centric care:** reflect on how the shift to value-based healthcare prioritises patient experiences and outcomes. Think about the implications this has for healthcare delivery, particularly regarding measuring success. How does focusing

on what truly matters to patients change how healthcare professionals approach treatment, and what roles do leaders have in the required shifts?

2. **Interdisciplinary collaboration:** the framework emphasises a team approach, integrating various healthcare disciplines. Reflect on the importance of such collaboration and how it might impact patient outcomes. Consider this interdisciplinary approach's potential challenges and benefits from the health leadership position.
3. **Measuring what matters:** one of the key themes was measuring outcomes that are meaningful to patients. Reflect on the traditional ways healthcare outcomes are measured and how this new approach could lead to a transformation in care delivery. What challenges might arise in shifting focus from process-oriented metrics to outcome-oriented ones, and how might leadership be required to support these changes?
4. **Systemic change and funding models:** reflect on the relationship between value-based healthcare and current funding models, like activity-based funding. Consider the changes necessary in funding and resource allocation to support a value-based approach fully.
5. **Adapting to patient needs and diversity:** the framework suggests tailoring healthcare to the needs of specific patient groups. Reflect on achieving this, especially in diverse populations with varying healthcare needs. What steps could ensure equitable and effective care for all?
6. **Professional and leader development:** consider the implications of this shift for your practice or healthcare professionals in general. How does embracing a value-based approach change the skill set and mindset required of healthcare workers and leaders?
7. **Future directions and innovations:** reflect on the potential future innovations and improvements a value-based healthcare system might bring. How could technology, data analytics and patient feedback drive continuous improvement in healthcare? Finally, what roles do health leaders play in developing a value-based healthcare approach to healthcare across all sectors?

Use these reflections to deepen your understanding and consider practical ways these concepts could be implemented or advocated for in your professional context or healthcare setting.

VIDEO: MARGARET LEE – PUTTING VALUE-BASED HEALTHCARE INTO PRACTICE BY NURSES

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://oercollective.caul.edu.au/value-based-health-care/?p=72#oembed-3

Source: Agency for Care Effectiveness MOH (31 minutes)

REFLECTION

Reflecting on the presentation on healthcare leadership and the transformative approach at Alexandria Hospital, several key themes emerge that can be applied in healthcare leadership contexts:

1. **Adaptation to demographics and societal changes:** understanding and adapting to changing demographics, such as an ageing population, is crucial. Reflect on how your healthcare practice or organisation is adjusting to these changes. Are there new services or care models that could better serve these shifting demographics?
2. **Person-centred care:** the shift to a model organised around patient archetypes emphasises the importance of person-centred care. Consider how your healthcare setting can more effectively centre on the patient's experience and needs. What practices can be implemented or improved to enhance patient-centred care?
3. **Interdisciplinary collaboration:** the concept of a unified care team involving various specialists highlights the significance of interdisciplinary collaboration. Reflect on the current state of interdisciplinary collaboration in your organisation. How can communication and collaboration between different healthcare professionals be improved to benefit patient care?
4. **Technology integration:** using technology, like for example Google Glass, for remote consultation and support demonstrates innovative approaches to healthcare delivery. Think about how technology is currently used in your healthcare setting. Are there opportunities to integrate new technologies to enhance care delivery or streamline processes?
5. **Value-based care:** the movement towards value-based care, where the focus is on the quality rather than the quantity of care, is a key aspect of modern healthcare. Consider how your organisation measures and improves the quality of care. Are there initiatives or strategies that could be adopted to promote value-based care further?
6. **Sustainability and future planning:** an emphasis on building sustainable practices and preparing for future challenges is vital. Reflect on your organisation's sustainability practices and planning strategies. How are long-term challenges being addressed?

1.6 Implications for practice

The following are the key implications for leadership practice in a value-based health or social care system:

1. Incentives must be built into payment systems to encourage creativity and innovation and to develop improved and effective care models at an efficient price that discourages gaming of the health payment system.
2. Care outcome measures designed in value-based healthcare guide clinician decision-making in an environment where evidence-based innovations to the care process are encouraged and rewarded.
3. Those implementing value-based healthcare can begin by examining areas within the Centers for Disease Control and Prevention's Healthy Days Measures, which assesses four key domains of self-rated general health, physical health, mental health and activity limitations.
4. Partnering with patients and their families is one of the most important components of value-based healthcare because it is person-centred and focuses on the relationship between clinician and patient.
5. Some options to explore for payment systems in value-based healthcare are pay-for-performance schemes, bundled payments, capitation models, bonuses and shared savings models.
6. In implementing value-based healthcare, focusing on decision-making grounded in valid and reliable data is important. This approach should be complemented by fostering a culture of innovation and creativity in care delivery among leaders and team members and maintaining open communication with patients and their families. Additionally, emphasis should be placed on leadership, effective teamwork, and the crucial aspect of recruiting and developing the right people.

Leading authentically emphasises building legitimacy through honest relationships and ethical actions that, in turn, maximise the efforts of others to achieve the goal of care with an efficient price.

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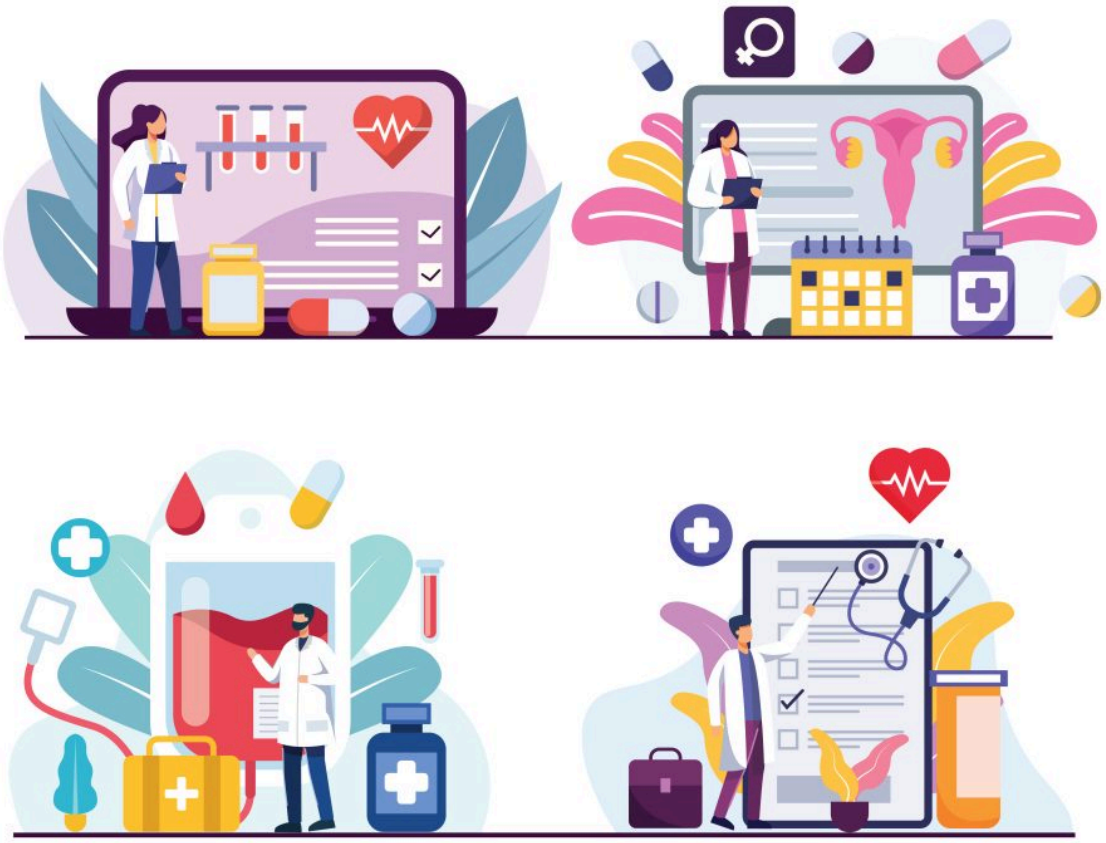
Chapter 2: Healthcare delivery models and value-based healthcare

Hanan Khalil



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A healthcare service, irrespective of size and complexity, might deploy several delivery models. The effectiveness of a particular healthcare service delivery model depends on its balance of advantages and disadvantages in comparison to its cost, which directly relates to the principles of value-based healthcare. An ideal health system should consider allocating resources to interventions that provide the highest population health benefits at the lowest cost. This might involve reallocating resources from less effective or costly interventions to more efficient ones, thereby improving the overall efficiency of healthcare systems. Restructuring the delivery of healthcare could serve as a strategy to enhance the optimal distribution of limited healthcare resources (WHO, 2016).

Healthcare delivery can be implemented in various ways, including the location it is delivered

(e.g. hospital to home), the individuals providing the care (e.g. healthcare professionals or other appropriately trained individuals), the setting (individuals or groups) and modes of delivery using technology such as teleconferencing (Jessup et al., 2020; Putrik et al., 2021). Providing services in alternative ways has the potential to be either similar or, in some cases, superior in terms of patient outcomes. However, this can also lead to cost shifting to other stakeholders or an increase in demand on that service (Roberts et al., 2023).

A recent scoping review detailing the characteristics of integrated care models found that there was a lack of sufficient descriptions of their characteristics despite some showing promising benefits or at least similar comparability to standard models of care. This results in insufficient data to determine effective components and costings (Rohwer et al., 2023). Therefore, in addition to efficacy, economic evaluations of alternative models of care delivery are required to inform decisions about the allocation of funding based on their relative value. High-cost models that deliver significant benefits to patients may be considered good value, while low-cost models of care that provide little or no benefit may have restricted value.

In value-based healthcare, the focus is on maximising patient outcomes relative to the costs incurred. This necessitates a thorough evaluation of different care delivery models to ensure that resources are allocated efficiently, achieving the best possible health outcomes for the population.

CHAPTER STRUCTURE

This chapter will cover the following topics:

- Healthcare delivery and value-based healthcare
- Framework for healthcare delivery models
- Evaluating healthcare delivery models
- Barriers to implementation
- Assessing an optimal model of care
- Implications for practice

2.1 Healthcare delivery and value-based healthcare

Having a variety of healthcare delivery models is crucial for cost-effectiveness, improved quality of care, increased accessibility, promoting preventative care, tailored services and increased resilience. Below are examples of each these aspects (Shrank et al., 2021).

Failure of care delivery in the US was estimated to amount to almost US$165.7 billion in 2019, according to a study by Shrank et al. (2021). The main components that contribute to this waste include clinician and hospital-related inefficiencies such as variability of provision of care by clinicians, and practice and system-based inefficiencies such as superfluous testing, medical errors, adverse events and lack of embracing prevention care practices (Shrank et al., 2021).

Healthcare delivery models are important because of the increasing demands of our ageing population and the high prevalence of chronic diseases creating increased pressure for hospitals and governments. These mounting challenges, including the increasing cost of care, have resulted in innovative ways to roll out a variety of healthcare models. For example, the COVID-19 pandemic resulted in increasing adoption of telemedicine and other virtual care modalities (Smith et al., 2020). An umbrella review examining the benefits of a variety of models of care highlighted some alternative models of care and their efficacy on patient outcomes. The authors found that while there was sufficient evidence to demonstrate comparable or improved care compared to usual care in the new models, factors such as local infrastructure, the health system context and patients' characteristics are important in determining the suitability of these models for the future (Roberts et al., 2023).

Variety of models

The variety of healthcare delivery models is crucial to enable accessibility for diverse populations and geographic areas. For instance, rural areas might benefit from telehealth services, while urban centres might have more specialised clinics. This variety ensures that healthcare services are accessible to a broader range of people. A review by Bradford et al. (2016) of models of care found that telehealth services have the potential to scale and replicate successful services to reach a wider spread of populations particularly in rural and remote areas. There are several factors that are essential to successful delivery of these models, including concept, ownership, flexibility, finances, proficiency and tools (Bradford et al., 2016).

Different healthcare delivery models emphasise various aspects of healthcare, including preventive care and health promotion. Community-based clinics, for instance, often focus on preventive measures and education to improve overall community health. For example, maternal and child healthcare clinics focus on many aspects of child wellbeing and development. Many clinics have

had positive impacts on monitoring children's early development and increasing mothers' knowledge (Vyas et al., 2024). A recent study by Mehrin et al. (2022) found that group-based parenting interventions at primary healthcare clinics had a significant positive impact on almost 91 per cent of the children in the intervention, compared with control. There were significant benefits for children's cognition, language, motor development and overall behaviours (Graif et al., 2021; Mehrin et al., 2022).

Patient needs

Not all patients have the same healthcare needs. By offering a variety of delivery models, healthcare systems can better tailor services to meet the specific needs of different populations, including the elderly, children, individuals with chronic condition and those requiring specialised care (Minvielle et al., 2021). This approach aligns with the principles of value-based healthcare, which emphasise the importance of customising care to enhance patient outcomes and efficiency. Healthcare customisation or patient-centred care has been the focus of many studies, due to its positive impact on patient outcomes. A scoping review by Minvielle et al. (2021) showed that the customisation of healthcare delivery models not only added value to patients but also contributed to positive patient experiences, reduced costs and improved quality of care and quality of life. This evidence emphasises the importance of value-based healthcare in creating flexible and responsive systems that deliver high-value, personalised care.

System resilience

Healthcare systems with diverse delivery models are more resilient to external shocks and challenges, which aligns with the principles of value-based healthcare. Value-based healthcare emphasises improving patient outcomes and ensuring efficient use of resources. For example, during the COVID-19 pandemic, telehealth and mobile clinics provided essential services when traditional healthcare facilities were overwhelmed or inaccessible. Filip et al. (2022) detailed the expansion of mobile health applications to ensure patients received appropriate care during emergencies. This development resulted in many digital applications that allowed healthcare providers and patients to communicate and manage treatment without risking their lives. Such adaptive approaches enhance the resilience of healthcare systems, ensuring that care remains patient-centred and outcome-focused, even in times of crisis. This underscores the importance of value-based healthcare in maintaining high-quality care delivery amid disruptions.

A model of care broadly defines the way health services are delivered.

This following video discusses the importance of innovative healthcare models.

VIDEO: INNOVATIVE HEALTHCARE DELIVERY MODELS

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://oercollective.caul.edu.au/value-based-health-care/?p=84#oembed-1

Source: AJMC (6 mins)

2.2 Framework for healthcare delivery models

In this chapter we explore a framework of six major healthcare delivery models:

1. Methods of delivery
2. Time of delivery
3. Place of delivery
4. Healthcare workforce of delivery
5. Coordination of care delivery
6. Technology-assisted delivery

This framework is based on the **Effective Practice and Organisation of Care** (EPOC) taxonomy of health systems interventions. The EPOC taxonomy includes four main domains of interventions:

- Delivery arrangements
- Financial arrangements
- Governance arrangements
- Implementation strategies

The taxonomy was first developed in 2002 and has been revised several times to include updates of health system interventions as they become available (EPOC, 2016). One of the drawbacks of using this framework is its potential overlap of interventions that can be classified across more than one domain. Nevertheless, this framework is relevant as it focuses on the function of the intervention within a particular context.

Methods of delivery

This model of healthcare delivery includes specialised outpatient clinics such as chronic disease management clinics to reduce waiting time for elective surgeries, maternal and child health clinics, and group versus individualised care. Examples of interventions include community-based health worker led interventions on cancer control, such as breast cancer for women, cardiovascular risk reductions for better control of blood pressure and cholesterol levels, and weight loss programs (Kim et al., 2016).

Time of delivery

Time of delivery models include triage clinics to improve patient management and admission clinics to reduce the administration burden on ward staff during hospital admissions. Examples of interventions include programs on emergency department (ED) visit reduction, improving patient flow and quality of care in ED and patient-centred clinics for patients with chronic conditions managed in outpatients. Other examples in this category include interventions administered by community paramedicine and mobile-integrated healthcare. These have been associated with high levels of patient satisfaction and reducing healthcare service use (Gingold et al., 2021; Gregg et al., 2019).

Place of delivery

This model of care delivery focuses on shifting care away from hospital settings and moving it to home settings or community health organisations. Examples include school-based clinics, outreach services and helicopter emergency medical services. Examples of interventions delivered in these places include using the ED for managing alcohol abuse, family violence and palliative care, home-based prevention and rehabilitation, waiting room interventions for sexually transmitted diseases, school-based health centres for mental health and home visits for child health and maltreatment and pregnancy (Gregg et al., 2019).

Mobile health clinics have been increasingly used as an novel model of healthcare delivery that is accessible to disadvantaged populations and individuals with chronic disease. These types of clinics offer a variety of services, such as primary care, dental care, prevention screenings, ophthalmology checks and mammographs (Gregg et al., 2019; Labeit et al., 2013).

Healthcare workforce of delivery

This model of delivery includes extending the scope of healthcare professionals, such as pharmacists, nurse practitioners and paramedics. This strategy has been successful in addressing workforce issues for medical practitioners in some areas. Examples of interventions include carer involvement in cognition-based interventions for people with dementia, nurse–physician substitution, pharmacist involvement in care for patients with chronic conditions, radiographers in advanced roles, interventions to increase breastfeeding, and advanced life support training for healthcare professionals at hospitals and ambulance teams (Yu et al., 2017).

Coordination of care delivery

This model includes transition care arrangements from hospital to home settings, integrated care models for a range of chronic diseases such as obstructive pulmonary disease, collaborative care

for mental illness and case management for heart failure patients. The spread of care coordination activities aims at ensuring patients experience less fragmentation, inconsistency and unplanned care. Lack of coordinated care can result in unnecessary emergency room visits, hospital admissions, avoidable readmissions and unnecessary expenses on hospital resources that have been estimated at US$25 billion to US$45 billion annually (Swan et al., 2019).

Technology-assisted delivery

This model of delivery focuses mainly on telehealth interventions, such as telephone counselling, mobile applications and internet-based programs. A recent scoping review addressing digital health innovations for non-communicable diseases during the COVID-19 pandemic highlighted the importance of technology-assisted delivery for mental health and neurological disease during the pandemic (Abd-Alrazaq et al., 2021). Their use has also been valuable in improving access issues in rural and remote areas (Murthy et al., 2023). More specifically, technology use enhanced patients' communication and personal health tracking. Other conditions where these interventions were implemented were in cancer management, cardiovascular diseases for prescriptions management, and diabetes management for client management and communications (Gudi et al., 2023).

Summary

A recent Australian study found strong agreement among various stakeholders about the potential of alternative healthcare models to enhance the sustainability of Australia's health system. It identified improving medical services in residential care, offering single-point-access multidisciplinary care for complex conditions, and implementing tailored early discharge and hospital-at-home programs as top priorities. However, while these priorities suggest areas of high stakeholder interest, further research is required to prove the effectiveness and cost-effectiveness of some of these models (Putrik et al., 2021).

2.3 Evaluating healthcare delivery models

Evaluating healthcare delivery models involves assessing various aspects of their performance, effectiveness, impact on patient outcomes, cost and patient satisfaction. Clinical outcome measures such as health services use, mortality rates, morbidity, complication rates and disease progression are important, in addition to patient-reported outcomes such as quality of life, functional status and satisfaction with care provided (Hollingsworth, 2016).

Cost–benefit assessment

Cost–benefit assessment can be done using various metrics, such as diagnosed or prevented conditions, life years gained or quality-adjusted life years (QALYs). QALYs are particularly significant as they consider both the length and quality of life. They are useful in comparing the benefits of different interventions, from cancer treatment to preventive measures like HIV screening, in a standardised manner (Thomas & Chalkidou, 2016).

Cost-effectiveness ratios

Cost-effectiveness ratios, expressed as dollars per health outcome, are commonly used in evaluating interventions. For instance, the cost-effectiveness of HIV screening might be expressed as $15,000 per QALY gained. However, assessing cost-effectiveness faces challenges such as varying evidence quality, obtaining accurate cost data and understanding how health outcomes impact patients' quality of life. Despite these challenges, careful analysis provides valuable insights into intervention effectiveness and cost-effectiveness (Thomas & Chalkidou, 2016).

Process evaluation

Process evaluation is also important to determine the most efficient way to implement a new system. Process evaluation could include assessing the model used, waiting times, appointment scheduling, coordination of care and adherence to treatment guidelines. It could also cover access and equity issues, such as geographical accessibility, affordability, equity across different population groups, socio-economic status and demographic characteristics (May et al., 2007).

By using a combination of evaluation methods and considering various stakeholders' perspectives, healthcare organisations and policymakers can make informed decisions about the adoption, adaptation or discontinuation of specific healthcare delivery models. Additionally, ongoing evaluation is essential to identify opportunities for improvement and ensure the delivery model's continued effectiveness and relevance.

2.4 Barriers to implementation

Several factors are crucial for the successful integration of alternative healthcare models into existing systems, including stakeholder engagement, careful planning, and investment in infrastructure and training. Seamless interoperability between different healthcare platforms and effective communication channels are also critical for ensuring continuity of care. Each of these factors have multiple barriers and facilitators. An overview of reviews by Rawlinson et al. (2021) highlighted several barriers for stakeholder engagement, including financial factors, increased workload for clinicians, lack of training and upskilling for the required technology, lack of sufficient communication between stakeholders, and resistance to change (Rawlinson et al., 2021). Other barriers to alternative models of care like e-health, especially for older adults, were reported to be lack of self-efficacy, knowledge, support, functionality and appropriate information provision (Rawlinson et al., 2021; Wilson et al., 2021).

2.5 Assessing an optimal model of care

Assessing the optimal model of care involves a comprehensive evaluation process, which may include one or many of the following measures.

Care objectives

Clearly outline the goals and expected outcomes of the care model, ensuring alignment with patient needs and healthcare standards.

Stakeholder engagement

Involve key stakeholders, including patients, healthcare providers, policymakers and community representatives, to gather diverse perspectives and ensure the care model meets the needs of all parties.

Needs assessment

Conduct a thorough analysis to identify the specific health needs and preferences of the target population, which helps in tailoring the care model to address those needs effectively.

Comparative effectiveness evidence review

Evaluate existing models of care by comparing their outcomes, effectiveness and efficiency using evidence from clinical trials, observational studies and real-world data.

Health technology assessment

Analyse the role of medical technologies in the care model, assessing their clinical efficacy, safety and cost-effectiveness to ensure they contribute positively to patient outcomes.

Economic analysis

Perform a detailed cost–benefit analysis to evaluate the financial viability of the care model, considering short-term costs and long-term savings and benefits.

Policy analysis

Review relevant healthcare policies and regulations to ensure the proposed care model is compliant and can be effectively implemented within the existing legal and regulatory framework.

Quality and benchmarking review

Assess the quality of care provided by the model using established benchmarks and performance indicators to ensure it meets or exceeds industry standards.

2.6 Case studies

This section presents several cases whereby alternative models of care resulted in improvement to patient care and cost savings.

Collecting and analysing the right measures allows for a holistic assessment of which model of care is best suited to meet defined objectives, address stakeholder needs and deliver high-quality, cost-effective healthcare.

Case 1: MeCare

A study by Carter at al. (2023) explored the impact of a new telehealth program (MeCare) on healthcare resource use, costs and patient-reported outcomes. The intervention involves a funded program from a health service to enable patients to self-manage their chronic diseases (Carter et al., 2023). It consists of a virtual care platform that uses home-based remote monitoring of patients' clinical measurements of blood pressure, heart rate and oxygen levels as outcome measures to identify patient progress.

The study used a pre and post design whereby baseline and post-intervention data were collected using administrative databases. Nursing staff did initial assessments to ensure the suitability of the patients to be part of the program. Real-time feedback and patient management was done remotely by trained nurses with access to the platform at the health service (Carter et al., 2023).

The program is provided free of charge to patients in the health service. However, the health service pays a fee per participant to the company providing the electronic platform for the provision of home equipment for patients for the ongoing monitoring (Carter et al., 2023).

Baseline data showed that patients enrolled in the study had a relatively high health services utilisation, amounting to A$34,000 per participant in the 12 months prior to enrolment. After implementation of the intervention and taking into account the cost of the program, there was a net saving of A$982 per participant-month for the health service, totalling to about A$2.3 million annually for this cohort. Participants also reported a high level of satisfaction with the program monthly.

The results of this study reinforce the benefits of using an alternative model of care such as telehealth for managing chronic disease (WHO, 2018). It was hypothesised that the savings were mainly from the adoption of multidisciplinary team care coordination, where nursing staff were more focused on ensuring patients were proactive in the management of their health, and the tailored model focused on prevention, which resulted in less access to health services or GP visits.

While the benefit of such programs is evident for health services and participants, maintaining such a program depends on ongoing funding from the health service as well as the full engagement of enrolled participants over the required time of their management. Patient attrition might render the program less effective in the long run. Further work is needed to explore how participant engagement can be improved to get the full benefit of these programs.

Case 2: Pharmacists in an intensive care unit

A study by Muñoz-Pichuante and Villa-Zapata (2020) detailed the impact of incorporating a pharmacist in an intensive care unit (ICU) working with a multidisciplinary team to advise on medication-adverse events, doses changes and overall management (Muñoz-Pichuante & Villa-Zapata, 2020). The study showed that across 12 months, pharmacists made 505 interventions for 169 patients. The interventions were grouped into six categories:

- prevention of adverse events
- resource utilisation
- individualisation of patient care
- prophylaxis management recommendation
- hands-on care, which includes a variety of interventions such as patient education
- support during crisis management.

Ninety per cent of these interventions were taken up by the medical team, which is aligned with other studies (Dalton & Byrne, 2017; Khalil, 2011). The savings from this model of care were calculated as cost savings and cost–benefit ratio. The authors concluded that incorporating a clinical pharmacist in a collaborative ICU team reduced healthcare expenses through treatment adjustment converted into cost avoidance. The total cost savings over the 12 months of the study were $US263,500, resulting in a cost–benefit ratio of 1:24.2.

2.7 Other modes of delivery

Home healthcare

Home healthcare services have been used by hospitals and community health services as an alternative delivery model to address demand. This model of care is beneficial for health systems that address rationalisation of hospital bed use and cost reduction. Many studies have addressed the effectiveness of this model compared to hospital care in terms of reducing adverse events and better patient management. has been. Curioni et al. (2023) examined its cost-effectiveness in a systematic review of 14 studies with a total of almost 3,000 patients. Cost savings and cost-effectiveness were shown in several studies in the review but were not consistent across all 14 studies and depended on the population and the conditions being managed Curioni et al., 2023).

2.8 Implications for practice

Various methods can be used to modify healthcare delivery, such as changing the delivery setting (e.g. shifting from hospital-based care to home-based services), providing care in group settings instead of individual sessions, substituting the care provided by one healthcare provider with that of another suitably trained professional or non-professional, or using technology like telehealth.

Embracing alternative approaches may lead to comparable or even enhanced patient outcomes. However, they could also affect costs directly or shift them to other stakeholders, and potentially alter service demand due to improved accessibility. Therefore, alongside evaluating effectiveness, comprehensive economic assessments of different care delivery models are essential for guiding funding allocation based on relative merits. High-cost models, despite providing significant patient benefits, could still be considered worthwhile investments, whereas low-cost care models offering minimal or no benefits may have restricted value.

ACTIVITY

1. From your clinical perspective, what are the main challenges in implementing alternative healthcare models to enhance value-based care?
2. Can you provide examples of alternative healthcare models that you believe could significantly improve value-based healthcare? How do they differ from traditional models?
3. In your experience, what are the key factors that contribute to the success of alternative healthcare models in delivering value-based care?
4. How do you think alternative healthcare models can address disparities in healthcare access and outcomes, particularly in underserved communities?
5. What role does interdisciplinary collaboration have in the implementation of alternative healthcare models to achieve value-based care?
6. How can alternative healthcare models be integrated into existing healthcare systems without disrupting continuity of care or increasing costs?
7. Are there specific patient populations or medical conditions for which alternative healthcare models are particularly effective in delivering value-based care?
8. What strategies do you recommend for evaluating the effectiveness and cost-effectiveness of alternative healthcare models in a real-world clinical setting?
9. How do you see the future of healthcare delivery evolving with the widespread adoption of alternative healthcare models, particularly in the context of value-

based reimbursement systems?

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Chapter 3: Funding models in healthcare services

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Value-based payment models aim to enhance value within health systems through several mechanisms. Initially, they transfer financial accountability and a portion of the financial risk to providers, incentivising the adoption of more cost-effective treatment approaches. Rather than remuneration based on the volume of services rendered, these models mean providers receive predetermined payments for specific care episodes, chronic conditions or comprehensive patient care. Consequently, providers face potential losses if care expenditures surpass the established price threshold, yet they may also save money if costs remain below this threshold. The extent of financial accountability and risk borne by providers varies depending on the design of the value-based payment model (Gray, 2017).

Furthermore, value-based payment models often integrate payments across multiple providers, promoting collaboration among healthcare professionals. The level of care coordination or integration varies depending on the breadth of the payment model. Some payment models, such as bundled payments, involve providers from diverse care sectors and inherently encourage improved care coordination; this isn't necessarily the case in other models focusing solely on one provider group. In such instances, promoting care integration may require alternative strategies such as enhancing data infrastructure or establishing new professional roles (Lindner & Lorenzoni, 2023).

Value-based payment models typically incorporate a quality component that ties payment to provider performance based on predetermined benchmarks. This serves to incentivise providers for delivering high-quality care and mitigate the risk of under-provision of care, which may inadvertently occur in innovative payment models incentivising cost containment (Lindner & Lorenzoni, 2023).

CHAPTER STRUCTURE

This chapter will cover the following topics:

- Funding models and value-based healthcare
- Underpinning theory
- Types of models
    - Fee-for-service
    - Capitation
    - Global budgeting
    - Pay for performance
    - Bundled care payment
    - Value-based purchasing
    - Accountable care organisations and shared savings programs
    - Time-driven activity-based costing
- Implications for practice

3.1 Funding models and value-based healthcare

Funding models play a pivotal role in determining how healthcare services are financed, organised and delivered in a healthcare system, directly impacting access to care, quality of services, patient outcomes and overall sustainability. Understanding different funding models is crucial for policymakers, healthcare administrators, providers and patients in order to make informed decisions and implement effective strategies to address healthcare challenges.

Traditional payment models have been shown to contribute to care fragmentation, as some fee schedules do not provide incentives for care providers to coordinate care with other healthcare providers. (Conrad, 2015). In contrast, value-based healthcare focuses on aligning financial incentives with patient outcomes, promoting coordination and efficiency. By adopting funding models that prioritise value over volume, healthcare systems can enhance service quality, improve patient outcomes and ensure long-term sustainability. Thus, knowledge of various funding models is essential for devising strategies that address the multifaceted challenges of healthcare, ultimately leading to a more effective and patient-centred system.

3.2 Underpinning theory

The theoretical underpinning of incentives established by innovative payment models draws on disciplines such as agency theory in microeconomics and behavioural economics (Conrad, 2015). Value-based payment models should yield favourable outcomes by mandating, rewarding or penalising provider behaviours. For example, incentivising providers based on reductions in healthcare spending or enhancements in care quality is likely to motivate them to adjust their treatment and referral decisions accordingly (Conrad, 2015). These models operate on the premise that individual providers seek to maximise a combination of net income (adjusted for the opportunity cost of physician effort) and patient health benefits, both of which are influenced by the quantity and quality of services provided (Conrad, 2015). These insights into behavioural implications have significant implications, including for the recognition of loss aversion's impact on diminishing the magnitude of penalties, fostering increased involvement of risk-averse providers in two-sided risk-sharing agreements, and strategically framing incentives as potential gains or losses to overcome inherent status quo bias.

3.3 Types of models

For a health system predominantly funded through government revenue, there is little difference between ‘funding’ and ‘payment’. But in health systems with mixed funding sources, funding may mean different things to payment. Value-based care needs to be enforced through funding mechanisms imposed by large funding bodies on behalf of consumers, while consumers share expenses through ‘out-of-pocket payments’, which are unlikely to be linked to value-based care. The following eight models represent a variety of funding models that are used internationally.

Fee-for-service

Fee-for-service (FFS) represents a traditional payment approach widely used in the global healthcare sector. Under this system, healthcare providers are reimbursed by government organisations or insurance providers for specific services rendered to patients. The quantity of services and procedures requested by the patient directly influences the remuneration received by the healthcare provider (Miller-Breslow & Raizman, 2020). Payments are disaggregated, with each service or item billed and compensated for separately. Consequently, whether it involves a doctor’s appointment, patient consultation or hospital admission, each instance of service provision results in individual billing by the respective agency or insurer. This method of payment has been used as the main compensation for providers for a long time. However, it can be thought of as an incentive system for providers to encourage more treatment for patients, resulting in more income.

There are several advantages of this type of care, including that access to care is guaranteed for patients, patients get to choose their procedures from a variety of treatments and the type of management can ease the burden of cost on patients. Disadvantages of this type of care include potential of out-of-pocket expenses for patients, lack of cover of preventative treatment, absence of accountability of medical providers and patients, and lack of awareness of the real costs of treatment for patients and providers (Brekke et al., 2020). FFS also encourages overservice/waste and low-value care, but governments can remove or de-incentivise low-value care through fee schedules.

The following example demonstrates how FFS could be applied to show either a profit or a loss. In general, hospitals have two types of costs: fixed and variable. Fixed costs include equipment, staff salaries and administrative overheads; variable costs include patients treated, medications and contracted labour.

Hospitals structured on a FFS basis experience financial gains with higher patient volumes but face losses during periods of decreased volume. In Table 3.1, scenario 1 shows the profit when the hospital experiences a 5 per cent increase in hospital admissions; scenario 2 shows the loss from a 5 per cent decline in admissions. Clearly, FFS funding is profitable when the number of patients

treated increases, and it runs at a loss when the service experiences a decrease in number of patients managed.

Table 3.1: FFS model on two scenarios

	Base	Scenario 1 (5% increase in admissions)	Scenario 2 (5% decrease i
Fixed cost	**$100 m**	**$100 m**	**$100 m**
Variable cost	**$100 m**	**$105 m**	**$95 m**
Total costs	**$200 m**	**$205 m**	**$195 m**
Revenue	**$205 m**	**$215.25 m**	**$194.75 m**
Profit (Loss)	**$5 m**	**$10.25 m**	**(–$250,000)**

Capitation

Managed care organisations employ capitation payments as a strategy to manage healthcare expenditures. These payments assign financial responsibility to physicians for their services to patients, thereby curbing the utilisation of healthcare resources. Simultaneously, to safeguard against potential underutilisation of healthcare services leading to substandard care, managed care organisations monitor resource utilisation rates within physician practices. These utilisation metrics are publicly disclosed as indicators of healthcare quality and may be tied to financial incentives such as bonuses (Basu et al., 2017).

Capitation entails a predetermined sum of money per patient per specific time period, provided upfront to physicians for delivering healthcare services. The actual payment amount is determined based on the range of services rendered, the patient population and the length of service. Capitation rates are established using local cost data and average service utilisation rates, hence exhibiting much regional variation. Many plans incorporate a risk pool, retaining a portion of the capitation payment until the end of the financial year. If the health plan functions well financially, these withheld funds are disbursed to physicians; conversely, in the event of financial underperformance, these funds are retained to cover deficit expenses (Andoh-Adjei et al., 2018).

A capitation agreement with healthcare providers lists the services to be provided for patients; for example, preventative and diagnostic treatments, immunisations, outpatients laboratory tests, health education and screening for vision and hearing. The amount of remuneration is based on the average expected healthcare utilisation of patients with certain medical comorbidities and demographic factors. The disadvantage of this model is that providers can end up treating more than the average number of patients specified in the agreement, resulting in a loss for the organisations (Basu et al., 2017).

Capitation may lead to underutilisation of high-cost care with high value. It may take several years to demonstrate value of care and annual capitation if funding cannot capture such value. The pros and cons of this model are outlined in this analysis.

Global budgeting

A global budget is a mechanism that assigns a set number of resources for the healthcare sector as a whole, rather than for specific individuals or organisations. Its primary objective is to regulate overall healthcare expenditure and ensure reasonable and affordable healthcare services. Global budgeting serves as a supplementary payment approach that can be integrated with other payment methods to create a framework adaptable to diverse contexts. The primary distinction among different schemes lies in the mechanism used to enforce the budgetary limit on the healthcare system (Lin et al., 2016). A study by Lin et al. (2016) examining the impact of global budgeting in Taiwan on healthcare utilisation found this funding model is associated with a significantly longer length of stay in hospitals, higher healthcare costs and poorer quality of care among patients with pneumonia.

Global budgets overcome the tendency of itemised payment systems to encourage higher volumes by broadening the scope of covered services. Unlike other payment methods that bundle services – for example, episode of care payments that encompass all hospital care for knee replacement patients, including the 30 days before and after hospitalisation – hospital global budgets offer supplementary incentives and avenues for controlling volumes and costs. This framework provides hospitals with distinct motivations to oversee their care provision within a predefined budgetary limit, thereby highlighting the policy goal of containing costs. Cost-saving measures from global budgeting can lead to risk shifting (e.g. cream skimming) and care delay. Exhibit 1 from this paper shows how global budgets are calculated based on a broader range of items for each diagnosis-related group (DRG) (Sharfstein, 2016).

Global budgets incorporate incentives aimed at encouraging hospitals to adopt strategies for care coordination, along with enhancing the overall health of patients. These initiatives, in turn, contribute to minimising hospitalisation. A hospital operating under a global budget that directs investments toward community-based programs emphasising care coordination, improved access to primary care providers and early intervention for chronic illness is likely to experience decreased costs and savings within the scope of its global budget, if the calculation is done appropriately (Porter, 2013).

Pay for performance

Pay for Performance (P4P) incorporates payment frameworks that combine financial incentives or penalties to provider performance. P4P forms a crucial component of the wider initiative aimed at transitioning healthcare towards value-based healthcare. Although it operates within the FFS system, P4P encourages providers to embrace value-based care by combining compensation to measurable

outcomes, evidence-based practices and patient satisfaction. This approach aligns payment structures with the delivery of value and high-quality care (Mendelson et al., 2017).

There are several advantages of P4P, including a focus on quality rather than quantity, promoting good clinical practice and focusing on positive outcomes. It also encourages transparency, as it reports on metrics that are usually publicly available in annual reports and therefore encourages good clinical practice. One of its disadvantages is that it does not necessarily cater for socio-economically disadvantaged populations, as they usually require higher care than the average patient, which may prompt some organisations not to manage them. These types of patients may struggle to follow advice regarding their health management due to factors including the affordability of medication and transport, and fallback on follow-up appointments, resulting in poorer health outcomes. Goal displacement is also a disadvantage of P4P, where health providers try to achieve performance goals set by funding bodies, rather than maximising value for patients (Mendelson et al., 2017).

For P4P to function appropriately for all types of patients, health leaders must devise appropriate patient management metrics and highlight the physician–patient relationship, evidence-based best practices and performance measures (Soucat et al., 2017). When designing programs, healthcare executives need to prioritise strategies that tackle the social determinants of health and incorporate measures promoting fairness to ensure equitable comparisons among providers. Additionally, they should incentivise clinicians and hospitals that demonstrate excellent performance in serving socio-economically disadvantaged patient cohorts, thus moderating the financial risks associated with caring for these populations.

Bundled care payment

Bundled care payment (BCP) is used as a means to lower costs. Under BCP, payments use a set fee based on an episode of care. Bundled-payment models take advantage of provider imperatives to manage budgets and ensure high-quality care. Healthcare organisations receiving bundled payments stand to benefit from increased profitability when patients require fewer services. However, they must also account for unexpected utilisation and complications, which can impact their financial bottom line. Public and private payers in numerous countries are embracing this type of payment in the belief that incentivising providers financially to prioritise value may yield better outcomes compared to placing financial burdens on patients through out-of-pocket expenses (Baicker & Chernew, 2017).

Most BCPs focus on chronic conditions with specific numbers of treatment days. For instance, for diabetes care bundles in the Netherlands a treatment plan spans 365 days. Conversely, bundles covering procedures such as total joint replacement (TJR) define the treatment plan in terms of the period of illness or treatment cycle. In TJR bundles, this episode encompasses preoperative, inpatient and post-discharge phases, with varying durations for each phase. The quantification of episodes in

TJR bundles show considerable variation; for instance, in the BPC model, the post-discharge period is capped at 180 days (Miller-Breslow & Raizman, 2020; Struijs et al., 2020).

Payers and providers have two primary options for payment flow strategies: (1) a pre-established price as a single payment to the accountable entity upfront; or (2) upfront FFS payments to individual providers (Miller-Breslow & Raizman, 2020). This type of payment has shown significant improvement in quality of care to patients and cost reduction to organisations, but challenges include the difficulty in defining patient populations for the bundled care, defining quality of care, and privacy laws and information sharing (Struijs et al., 2020).

Figure 3.2 shows how a bundled payment might work for a surgical procedure. The provider is paid a lump sum for all the services in a given episode; reimbursement is withheld for costs in excess of that amount.

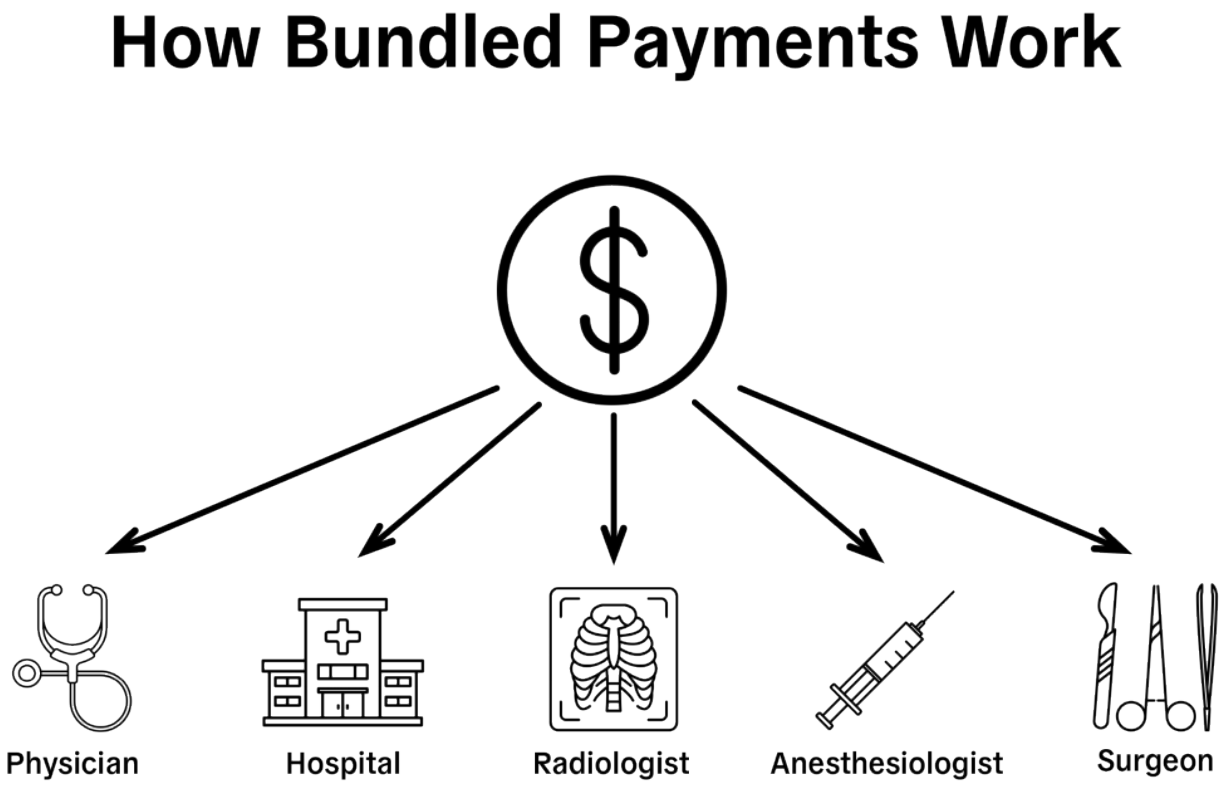

Figure 3.2: A schematic representation of bundled payments. Source: xray by Giorgi from Noun Project (CC BY 3.0); Syringe by Giorgi from Noun Project (CC BY 3.0); Hospital by Giorgi from Noun Project (CC BY 3.0); Stethoscope by Giorgi from Noun Project (CC BY 3.0); surgery instruments by Giorgi from Noun Project (CC BY 3.0); dollar by DailyPM from Noun Project (CC BY 3.0).

Value-based purchasing

Value-based purchasing (VBP) is a healthcare payment model that ties financial incentives and

reimbursements to the quality of care provided by healthcare providers. In a VBP system, healthcare purchasers, such as government payers, insurance companies or employers, use various quality measures and performance metrics to assess the value of healthcare services delivered by providers. Providers are then rewarded financially for delivering high-quality care and achieving positive patient outcomes, and face penalties for underperformance or low-quality care (Chee et al., 2016). VBP focuses on patient outcomes, satisfaction and overall quality of care rather than just the volume of services provided.

Providers are evaluated based on value metrics, such as patient satisfaction scores, clinical outcomes, adherence to evidence-based practices and efficiency measures. Providers are financially incentivised for meeting or exceeding quality benchmarks and achieving positive outcomes. Conversely, they may face financial penalties for poor performance or failure to meet quality standards. VBP rewards healthcare providers based on the quality and efficiency of care delivered, as measured by various performance metrics and patient outcomes. It typically involves a broader range of services and performance measures beyond specific episodes of care than bundled payments, where the focus is on reimbursing providers a single, predetermined payment related to a specific episode of care.

While VBP has several advantages for patients and providers to improve quality of care, the biggest challenge is that these programs often require significant administrative resources for data collection, reporting and performance monitoring. This can impose additional administrative burdens on healthcare providers and organisations, particularly smaller practices or facilities with limited resources. Moreover, providers in VBP programs may bear financial risk if they fail to meet performance targets or if patient outcomes are poorer than expected. This risk can deter participation, particularly for providers caring for high-risk or complex patient populations (Chee et al., 2016). The following video outlines VBP and how it is calculated.

VIDEO: WHAT IS VALUE BASED PURCHASING?

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://oercollective.caul.edu.au/value-based-health-care/?p=111#oembed-1

Source: AHRMM (4 mins)

Accountable care organisations and shared savings programs

An accountable care organisation (ACO) is a delivery model of care that seeks to progress the quality of healthcare provided and limit costs. In an ACO, a group of healthcare suppliers, including hospitals, physicians and other healthcare professionals, voluntarily come together to collaborate and coordinate care for a specific patient population (Miller-Breslow & Raizman, 2020). They are often accountable for the overall health outcomes and expenditures of the patient population they serve. Their main goals are to focus on managing the health of their entire patient population, not just individual patients. This includes preventive care, chronic disease management and addressing social determinants of health to improve overall health outcomes and reduce healthcare utilisation. They engage patients in shared decision-making, promote patient education and self-management, and emphasise the importance of communication and continuity of care.

ACOs often participate in alternative payment models, such as shared savings or shared risk arrangements, where they may receive financial incentives for meeting quality and cost targets or may be accountable for financial losses if they exceed predefined spending thresholds (Shortell et al., 2015). The performance of ACOs varies, as they are dependent on multiple factors such as providers' understanding of and commitment to care coordination and successful integration of processes within organisations (Comfort et al., 2018).

Time-driven activity-based costing

Within value-based healthcare, costs are ideally assessed using time-driven activity-based costing (TDABC). With TDABC, the actual costs incurred in delivering care to patients with specific conditions are meticulously calculated from the ground up, scrutinising each step of treatment and the associated costs of each process involved. TDABC methodology aids in pinpointing opportunities for cost reduction and determining the appropriate pricing for procedures (Keel et al., 2017). It has been presented as a better way to measure the cost of care, as it adapts to the complications of care provision in healthcare organisations. In 2011, Robert Kaplan and Michael Porter detailed a seven-step approach to the application of TDABC in healthcare settings:

1. Select the medical condition
2. Record all the main activities performed within the entire care cycle
3. Develop process maps that include each activity in patient care delivery, including all direct and indirect capacity-supplying resources
4. Obtain time estimates for each process
5. Assess the cost of supplying patient care resources
6. Assess the capacity of each resource
7. Calculate the total cost for each patient

(Porter & Kaplan, 2011)

TDABC calculates the direct and indirect costs of care for patients; however, it may be seen as complex due to the number of steps involved in and the various methods of calculation (da Silva Etges et al., 2020).

3.4 Case studies

Case 1: Osteoarthritis care

Value-based healthcare has been applied by the New South Wales (NSW) Government in Australia to improve osteoarthritis care. NSW Health initiated the Osteoarthritis Chronic Care Program, where they refocused the outcome measures from the number of surgeries for knee replacement to addressing pain level and hip or knee functional outcome (Koff & Lyons, 2020). The new approach aligns with NSW Health's definition of value-based healthcare, which incorporates what value means for all stakeholders involved, including patients and healthcare providers and ranging from improvement of health outcomes, improvement in the experiences of patients receiving care and of clinicians providing care, and overall better quality of care (Koff & Lyons, 2020). The program is a modified version of a bundled care model.

Several gaps were identified in the old system and initiatives were selected to address issues with existing clinical service delivery model, highlighting areas for potential patient benefit, including experiences and reported outcomes and strategies to reduce clinical variations across the system. Enablers of the new system included collaboration across teams and organisations to integrate NSW Health's Leading Better Value Care program initiatives and a robust system of measuring and reporting patient outcomes.

Evaluation of the osteoarthritis chronic care program, including a pilot of 5,140 patients, showed that 4 per cent of hip and 11 per cent of knee patients who participated in the program were removed from the surgical waitlist as their conditions had improved and no longer needed surgical interventions. Similar initiatives were done in the areas of chronic heart failure, chronic obstructive pulmonary disease, management of diabetes mellitus for inpatients, falls in hospitals and renal supportive care (Koff & Lyons, 2020).

Case 2: Mental health treatment

Another recent case study demonstrating value-based healthcare in mental health focused on depression in a large psychiatry and psychology department in a hospital in Netherlands (Vegter et al., 2024). The team at St Antonius Hospital focused on measuring and improving the outcomes and costs of care for patients with depression using a scorecard with various indicators and a modified version of TDABC and activity-based costing. Indicators included outcomes, costs and processes to capture the whole patient management journey in the hospital, with specific indicators such as percentage of patients with more than 50 per cent symptom reduction according to a specific

questionnaire, length of stay with and without clinical treatment, treatment duration and percentage of patients treated as outpatients.

In addition to creating a scorecard, the team underwent several consultations with patients and carers to identify issues with patient management. The team was able to map the necessary indicators without increasing the registration burden for patients. Moreover, the information platform at the hospital was updated to provide real-time data on patient conditions with an added function for patients to also enter their data. The improvement team acted as a champion for this process and coordinated with the rest of the department to collect input and implement improvements. There were also regular meetings and newsletters to all staff involved to update them on the initiative. This resulted in significant improvements in waiting time for various treatments, from 17 days to 10 days after the implementation (Vegter et al., 2024).

3.5 Implications for practice

In a healthcare system characterised by persistent waste of scarce resources, there is an imperative for innovative approaches to revamp service delivery. As demonstrated in the literature, these methods have the potential to generate substantial cost reductions. Payment models that incentivise organisations to enhance cost control and outcomes offer a means to mitigate the ongoing rise in healthcare spending.

ACTIVITY

1. What is the fee-for-service (FFS) payment model, and how does it work?
2. What are the advantages and disadvantages of FFS payment for healthcare providers and patients?
3. How does FFS payment impact healthcare costs, quality of care and patient outcomes?
4. What is capitation, and how does it differ from FFS payment?
5. What are the advantages and disadvantages of capitation for healthcare providers and patients?
6. How do bundled payments encourage care coordination and efficiency across the continuum of care?
7. Can you provide examples of healthcare services or procedures commonly reimbursed under bundled payment arrangements?
8. What are the goals of accountable care organisations (ACOs), and how do they differ from traditional FFS models?
9. What are the advantages and challenges of ACOs for healthcare providers, payers and patients?
10. How does value-based purchasing differ from traditional FFS payment models?
11. What are the key components of value-based purchasing programs, and how do they incentivise providers to deliver high-quality, cost-effective care?

3.6 References

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Chapter 4: Creating value with health and information technologies

Sheree Lloyd and Helen Cooper

Source: Illustration by macrovector from Freepik.

The healthcare sector faces many challenges, including the ability to provide services to an ageing population, a growing burden of chronic and non-communicable diseases, the impact of climate change on health, and difficulties in attracting and retaining a skilled workforce. The burden of chronic disease, ageing and rising costs of devices, medications, buildings and assets and human resources means that delivering healthcare to populations is expensive. Many governments and health funders are asking about alternative solutions and preventative measures so that healthcare delivery is sustainable into the future, as good health underpins a productive and stable society.

The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition.
(Constitution of the World Health Organization, 1946)

Across the globe, there is an urgent need to change the way that healthcare is delivered, focusing on improving outcomes for individuals and where the population is at the centre of the required changes. The concept of value in healthcare has been explained elsewhere in this text and payment reforms are necessary to incentivise a move to recognise value. There are ways that health information systems and technologies can contribute to the ongoing sustainability of health and social care systems. In this chapter, we will explain how health and information technologies can be leveraged to create value, reduce cost, increase access and improve efficiency and health and treatment outcomes.

This chapter will explore concepts and topics regarding how health and information technologies can support sustainable value-based healthcare with the prospect of improving value and sustainability through the appropriate use and application of these technologies.

CHAPTER STRUCTURE

The chapter sections give the reader an introduction to some key benefits and challenges in applying health and information technologies to achieve better value in health and social care settings. Specifically, the chapter looks at the application and use of digital tools and solutions in health and social care in the following topics:

- Understanding current challenges in health and social care and the need for value
- Defining the role of health and information technologies in creating value for the sustainability of the health and social care system
- Value creation through enhancing efficiency and reducing costs, improving patient outcomes and experiences, and fostering collaboration and communication
- Ensuring sustainability, including economic considerations, environmental impact, and social and ethical implications
- Case studies that showcase successful implementations of health and information technologies and highlight positive outcomes in terms of improved sustainability and to provide learnings from real-world examples
- An overview of future directions and challenges, including emerging technologies in health and social care, anticipated challenges in the widespread adoption of technology and strategies for overcoming barriers and promoting continuous improvement

The topics are supported by a range of activities to engage in the concepts and issues.

4.1 Information technologies and value-based healthcare

Resource constraints and lack of investment in health information technologies and infrastructure have been barriers to the widespread use and transformation of healthcare. Banking, agriculture, retail and other sectors invest heavily in digital solutions and recognise technology as integral to the achievement of their strategic intentions (Lloyd & Craig, 2023). These industries have invested in the acquisition of hardware, software, human resources, and the development of digital applications such as online banking, self-service portals and mobile apps to deliver anywhere, anytime access to services. Sufficient resources are also required to protect digital assets and customer data from fraud and theft in health and social care organisations (Lloyd & Craig, 2023).

Implementing digital technologies and information systems and safeguarding against data breaches, ransomware and other malicious acts is a strategic priority and is particularly relevant in the health and social care industry due to the sensitive and personal nature of data stored in healthcare information systems, apps and patient records. Digital transformation of the healthcare system is reliant on the interoperability of systems and data sharing. Standards and terminologies to support technical interoperability of systems across the healthcare sector to facilitate information sharing are key initiatives. Australia is progressing a national plan to address interoperability that outlines the actions to support safe, secure, efficient and quality care and achieve a connected and consumer-focused healthcare system (Australian Digital Health Agency, 2023). To underpin this, one priority is to drive the integration and utility of digital solutions across care settings and increase the amount of real-time information available to care teams (Australian Digital Health Agency, 2023). This will improve the efficiency, effectiveness and sustainability of the health system and leverage the value that data sharing offers. The transition between care settings – for example, acute to primary, residential aged care to acute – can be supported by information, but interoperability is required to gain optimal benefits. The consistent use of agreed terminology and minimum system specifications is needed to support the secure sharing of information (Australian Digital Health Agency, 2023).

Figure 4.1 shows the five priorities identified to advance digital health interoperability in Australia (Australian Digital Health Agency, 2023). These priorities include the accurate and unique identification of individuals, supporting innovative initiatives to promote and spread interoperability such as HL7/FHIR™ (Australian Digital Health Agency, 2023) and secure information sharing with and from care providers who have valid reasons to view health information.

Figure 4.1: Five priorities for Australia to advance digital health interoperability
Source: National Digital Health Strategy 2023–2028 (Australian Digital Health Agency, 2023). Used under CC BY-NC 4.0.

Abundant data

The health industry is now generating an abundance of data, but this is not always in formats readily accessible to inform decision-making. There is huge value in using information assets effectively and efficiently. Health and social care organisations have a wide range of data and knowledge that is collected and that is essential for delivering care, optimising operational efficiency, and driving clinical, managerial and strategic decision-making. Electronic medical records (EMR), patient demographics, medical history, diagnostic test results and treatment plans are valuable data sources. EMR systems can be used and interrogated to reduce medical errors and support diagnosis

and treatment. Analysis of human and financial resource management data can be used to streamline administrative processes, optimise resource allocation and identify opportunities for cost savings. Furthermore, analysis of healthcare data can facilitate population health management initiatives and disease prevention strategies to improve healthcare delivery and overall population health outcomes. The World Bank (2023) has identified that, in challenging fiscal environments, people-centred and evidence-based digital investments can help governments save up to 15 per cent of health costs.

Mobile technology

Mobile phones support individuals to access health information and services and can be used for remote patient monitoring, medication adherence tracking, telehealth consultations, health tracking through apps, and facilitating communication between healthcare providers and patients. Mobile devices can also be used for disease surveillance to gather real-time data on symptoms, outbreaks and disease spread. Mobile applications and text message reporting systems can support health authorities to monitor trends, detect outbreaks early and implement timely interventions to mitigate the spread of infectious diseases.

In geographically vast and dispersed countries such as Australia high-speed internet connections and bandwidth capacity to support mobile applications, telehealth and Internet of Things applications are needed to expand access to healthcare services. We saw the value that these digital technologies can offer through the global COVID-19 pandemic. Without the ability to teleconference during the pandemic, health service delivery would have been much more severely impacted. However, robust infrastructure and an increased deployment of such technologies is needed to better leverage the full value that these tools offer to consumers and providers.

ACTIVITY

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4.2 Underpinning theory

Several theories and models have been used to inform this chapter that are essential foundations for successful digital health implementation. The underpinning theories can be applied to lead successful digital health initiatives to gain the value and benefits anticipated. Table 4.1 shows some of the key theories relevant to this chapter.

Table 4.1: Key theories

Domain	Theory or framework	Description
Evaluation of healthcare information systems	**Technology, People, Organisations and Macroenvironmental factors (TPOM) Evaluation Framework** **(Cresswell et al., 2020)**	**The TPOM framework (Cresswell et al., 2020) is a robust analytical model for evaluating healthcare information systems. Its strength lies in its comprehensive approach, encapsulating dimensions described in previous models and necessary to understand the complexities of technology adoption and implementation in healthcare settings. By considering technology, people, organisations and macroenvironmental factors, the framework offers a holistic view that enables practitioners to delve into the complex dynamics at play within healthcare IT initiatives (Cresswell et al., 2020).**
Innovation diffusion and complexity	**Non-adoption, Abandonment and Challenges to the Scale-Up, Spread and Sustainability (NASSS) Framework** **(Greenhalgh & Abimbola, 2019)**	**The NASSS framework, developed by Greenhalgh and Abimbola (2019), is a model designed to analyse the complexity of technological innovations within healthcare settings. It consists of seven domains: the illness context, the technology, the organisation, the adopter system, the embedding and adaptation process, the interactional workability and the wider context. By examining these domains, the NASSS framework helps researchers and practitioners understand why some healthcare technologies succeed while others fail, considering the intricate interplay of social, technical and organisational factors.** **The NASSS framework supports those working in digital information technology to predict and evaluate technologies in health and social care settings. When applied, the framework adds to the value proposition through improved system design and identifies technologies that may have limited scope for success and widespread adoption and, importantly, how we can learn from program failures.**
Evaluation of health information systems and technology	**Human, organisation and technology fit (HOT-fit) model** **(Yusof et al., 2008)**	**The HOT-fit model proposed by Yusof et al. (2008) is a conceptual framework used to evaluate the alignment or fit between humans, organisations and technology within an information system context. The model emphasises the importance of ensuring compatibility between these three elements to achieve successful information system implementation and outcomes.** **Applying this model improves how health and information technologies align to the organisation, the people and the context, ensuring a 'fit' that aligns with the organisation's work, purpose and function.**

User acceptance, adoption, and usability	**Technology acceptance model (TAM) (Davis, 1989)**	**TAM has been widely used in research and practice to evaluate and predict users' acceptance and usage of various technologies, including software applications, websites and online platforms, mobile apps and information systems within organisations.** **Since Davis (1989) first described TAM, it has been extended and adapted to various contexts and technologies. Applying this model allows us to quantify how well the technology supports and meets the requirements of users through measurement of perceived ease of use and perceived usefulness. While there are some criticisms of the framework, it remains well regarded, as it provides a useful and informative tool to establish acceptance and usefulness in health and social care settings.**

4.3 Value creation

Digital health innovations are altering many aspects of health and social care with potential to transform care and care delivery to support a person-centred approach (Almond & Mather, 2023). Further transformation requires changes in leadership, culture and ways of working to support the effective adoption of health information systems and technologies.

Health and social care services rely on the collection and sharing of data for the care of patients in hospitals and residents in aged care. This same data is also critical for the monitoring of safety, quality of care, and organisational performance and accountability. Information technologies have traditionally been used in these settings to help with the collection of data, often from a transactional perspective. The digital world of the 21st century offers the opportunity to apply information technologies beyond transaction-based solutions to generate value from these rich datasets. The value gains may be in research through data mining, through better health outcomes from shared data across a person's lifetime or through true real-time monitoring of safety and quality of care and improved system monitoring. EMRs, for example, have been widely adopted in Australia and other countries. Globally, much of the data we collect is underutilised due to a variety of reasons, including a perception that it is not relevant or reliable to inform decision-making. According to the World Bank (2023), despite technological progress and data availability, health policy decisions in many countries are not always based on reliable data. Further they estimate that some countries use less than 5 per cent of health data to improve health (World Bank, 2023).

Telehealth and remote monitoring

Telehealth and remote patient monitoring have been widely adopted, extending access to a scarce health workforce, particularly in rural and remote locations. However, we have also seen an explosion of telehealth and remote monitoring in large metropolitan centres as approaches to avoid hospitalisation and to support a more person-centred approach. In NSW, the virtualKIDS urgent care service, developed by the Sydney Children's Hospitals Network now provides a statewide service for children up to 16 with non-life-threatening health concerns (McDonald, 2024a). virtualKIDS connects families with a triage nurse who then determines the best care pathway and care provider. They triage children to the emergency department, when necessary, for a consultation with a virtualKIDS paediatrician or a visit to their local GP or urgent care centre (McDonald, 2024a).

Data analytics

Big data and analytics for predictive healthcare and artificial intelligence (AI) are emerging areas with potential to predict underlying health conditions and initiate preventative treatments or plans.

Using advanced techniques and machine learning, vast amounts of healthcare data can be analysed. Analytical tools identify patterns, correlations and individuals at risk of disease; care plans can be personalised and early intervention and treatment initiated. AI is now routinely embedded in many software packages and used to support clinical decision-making, such as medical image analysis, where algorithms can interpret MRIs and X-rays with high precision, aiding clinicians in making accurate diagnoses. AI is being integrated into a widely used medication management app (MedAdvisor) so that support on medication use can be provided to patients 24/7. This kind of tool can avert dosage or other errors relating to the correct timing and use of prescribed medications. Medication adverse events and poor compliance are costly to the health and social care system and impact on treatment efficacy. Naïve chatbots will be replaced with conversational AI to enhance the consumer experience and provide accurate and personalised education about medication (McDonald, 2024b).

Better value healthcare

We have already described that interoperability, integration and standards help to create efficiency, data sharing, secure messaging and value. They support data collection, management and storage, ensuring that there is a common understanding of concepts and processes for data management. In the discussion above we have identified ways that AI, telehealth and other applications can improve diagnosis, predict and prevent illness. The current challenges in health and social care suggest that a major shift is required, from disease-focused models of care to informed, self-managing patients who actively direct their healthcare (Greenhalgh et al., 2010). New models of care can be enabled through electronic healthcare records (longitudinal summaries across a lifespan from cradle to grave) extracted from EMRs (organisational records) that link to personally held records that are shared with treating clinicians to maintain continuity of care (Greenhalgh et al., 2010). Specific examples of how health and information technologies can transform low-value healthcare to better value healthcare include:

- **Patient safety:** improved monitoring using digital real-time devices that alert clinical staff to the need for earlier intervention of disease processes;safer medication practices that reduce the potential for error and waste
- **Resource efficiency and effectiveness:** better resource scheduling (human and physical); bed management software that supports improved bed and staff utilisation
- **Cost management through improved resource management and utilisation:** often achieved through waste reduction (physical and time)

The case studies in the following section provide further examples of how health and digital technologies can transform low-value situations into better value and better outcomes.

Figure 4.2 (Greenhalgh et al. ,2010) illustrates the transformative impact of this shift, creating parity

between patients and health providers and putting health information into the hands of individuals. With the ability to hold personal health information, individuals can take a more active role in their healthcare. Information age healthcare also signals a change in the role of health providers from authorities of care to partners and facilitators of care. For example, if a chronic disease is diagnosed, the recipient of the diagnosis would be referred to a specialist team who would provide education, management tools for their condition and monitoring devices. Regular monitoring and alerts in home and treatment settings can flag with consumers and healthcare professionals when intervention is required.

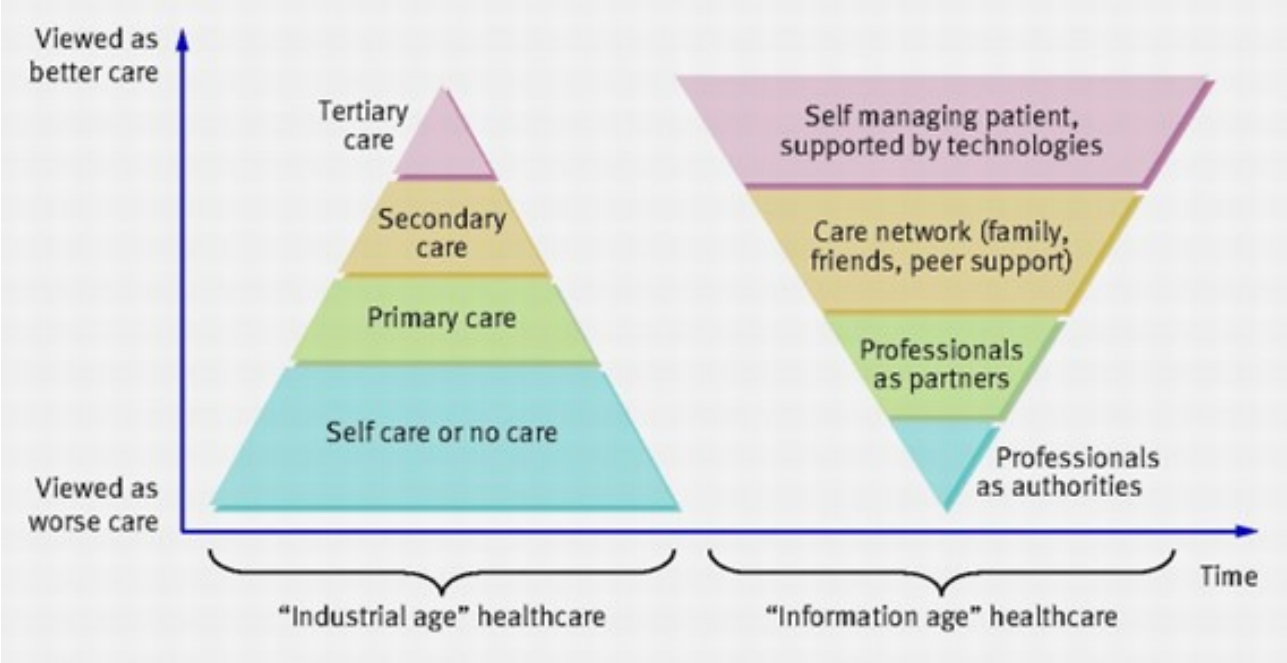

Figure 4.2 : Industrial age healthcare and information age healthcare and the role of professionals, individuals and care networks
Source: Fig. 1 in Greenhalgh et al. (2010). Adoption, non-adoption and abandonment of an internet-accessible personal health organiser: Case study of HealthSpace. BMJ, 201, c5814. Used under CC BY 4.0.

When considering the acquisition of digital health tools or health information systems, benefits to consumers and the health and social care system must outweigh costs. In health it can be difficult to quantify and comprehensively capture the value and benefits from investment in digital health solutions, such as workforce satisfaction, savings from averted hospital admissions and improvements to safety and quality (Woods et al., 2023).

> *Focusing solely on financial measures is unlikely to deliver a comprehensive view of the value of digital health.*
> *(Woods et al., 2023)*

Figure 4.3 shows a mapping of improvements that can be generated from EMRs and mapped against Woods et al.'s (2023) 'quadruple aim' for health.

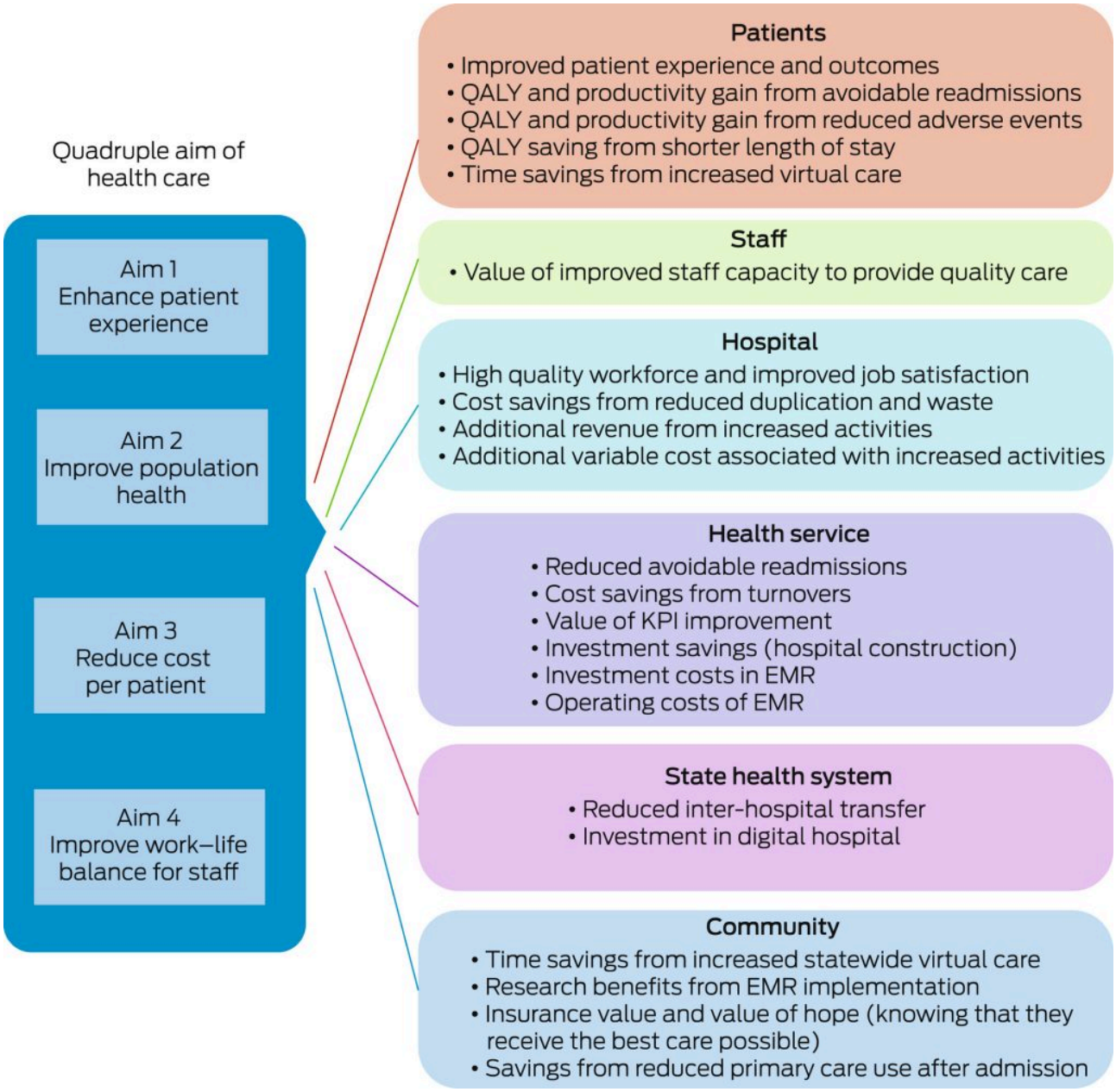

Figure 4.3: Mapping the quadruple aim of healthcare to impacts of the EMR
Source: Box 3 in Woods et al. (2023). Show me the money: how to we justify spending health care dollars on digital health? Medical Journal of Australia, 218(2), 53–57. Used under CC BY 4.0.

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4.4 Digital solutions

Digital health can enhance efficiency, reduce costs and support healthcare workers and consumers. Digital health solutions will not decrease the need for clinicians and their expertise (Kolasa & Kozinski, 2020). Digital health solutions offer the potential to create value by supporting clinical decision-making more effectively. Further, they can support the delivery of safer treatments and efficiency gains through innovative models of care delivery, reduction of delays and more consumer- and clinician-friendly organisation of the healthcare system.

The administrative processes used by healthcare providers can be time-consuming to complete and often involve the collection of similar or the same information multiple times. Streamlining administrative processes can reduce delays for administrative staff, clinicians and consumers. Optimising resource allocation is another way that value can be attained using health information systems and digital tools. With AI there are opportunities to enhance workforce allocation and improve diagnosis reliability (Scott et al., 2021). By analysing various data points, such as patient volumes, case mix, patient acuity, staff schedules, skill sets and patient needs, AI tools can optimise workforce allocation. Predictive analytics can forecast demand for healthcare services across different departments and timeframes, allowing health service managers to adjust staffing levels. Workforce management systems can also consider factors like staff preferences, qualifications and availability to create schedules that reduce overtime, burnout and maintain staff wellbeing.

Scenario analysis and what-if modelling using advanced data analytics or simulation packages can also help healthcare teams test different scenarios, like adding another operating theatre, before making real changes. For example, staff can input data into the software to see how adding a new theatre affects things like surgery wait times and staff workload. By trying out different scenarios, teams can figure out the best time to make changes and improve how the department works. These packages help the analysis and optimisation of healthcare processes, reducing bottlenecks and improving resource allocation and flow. Tools can be used for tasks like designing layouts for new facilities, testing different staffing levels, predicting wait times and assessing the impact of changes in workflow or equipment.

Preventative care through data-driven insights such as measures of cholesterol, blood pressure, education, lifestyle history and genetics can help identify individuals at risk of cardiovascular disease. Based on this data clinicians could support individuals to adopt preventive measures such as medication, lifestyle and dietary changes, and smoking cessation to reduce the risk of heart disease and stroke.

For digital health to add value the World Bank (2023) has identified three required areas to ensure that the value and benefits are available to all, including underserved populations. They state that to

embrace an approach where digital is a routine part of health – 'digital-in-health' – the three essential areas for investment by governments in digital and data are to prioritise, connect and scale (World Bank, 2023). Figure 4.4 shows the elements that are included in each of these areas.

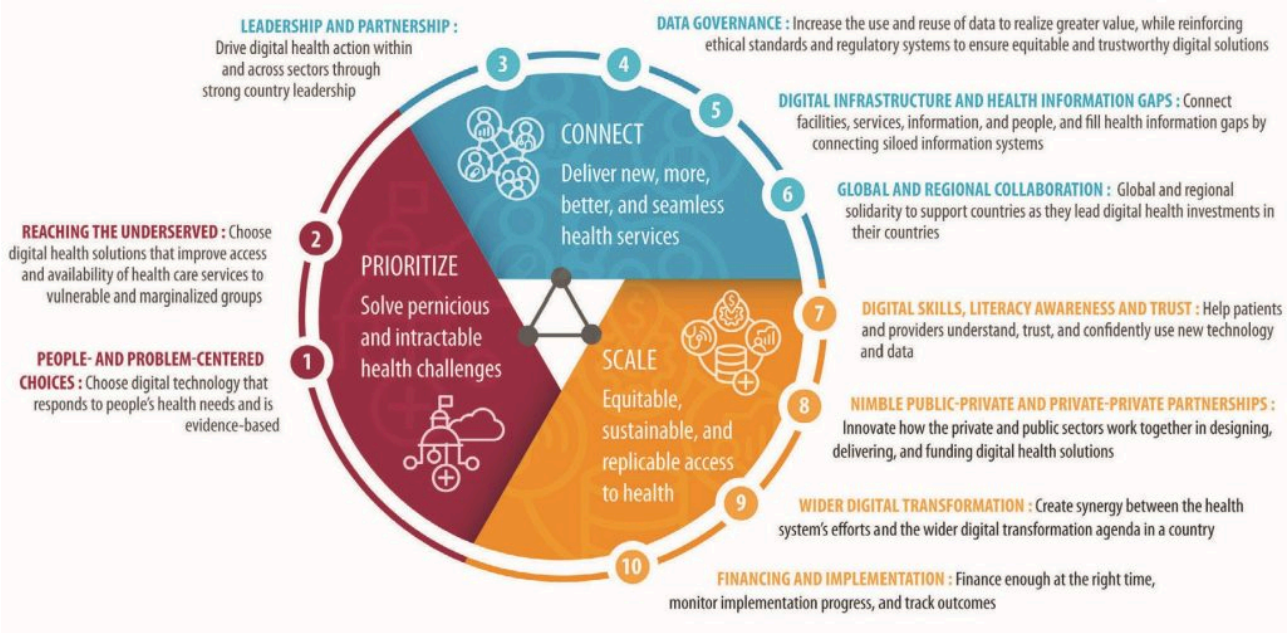

Figure 4.4: Three areas needed for digital-in-health to add value
Source: Digital-in-health: Unlocking the value for everyone. Summary. World Bank (2023). Washington DC. Used under CC BY 4.0.

4.5 Improving consumer outcomes

Genes and environmental factors can influence the progression and trajectory of disease processes. Each person will have a different response to treatment, and some treatments will fail to yield results on some individuals depending on their characteristics and their disease. Some cancers, for example, respond well to immunotherapies in some individuals but not others. AI and analysis of large datasets can identify genetic insights and data to tailor treatment interventions. This can result in more effective treatments and minimise adverse events through the selection of targeted therapies.

Remote monitoring with real-time tracking can reduce the need for hospitalisation if early signs of deterioration are recognised and treatment initiated. Timely intervention can allow treatment in place and decrease clinic visits. Wearable devices can transmit data to healthcare providers to prevent complications, remove travel time, enhance patient satisfaction and reduce costs for patients and the healthcare system. In remote locations telehealth can increase healthcare accessibility and extend options to patients with mobility limitations. Specialist care can be made available to all, thus negating geographical and mobility constraints, promoting better disease management and improving healthcare equity.

4.6 Evidence-based care

Digital health can generate and manage evidence to support the delivery of evidence-based care. Digital health technologies can foster collaboration and communication between clinicians and support staff involved in helping individuals to recover or maintain good health. There are several reasons why collaboration and the delivery of evidence-based care is challenging. One of these is the **knowledge-action gap** in health. The knowledge-action gap refers to the conundrum that we often know what works to improve health, but we struggle to put those ideas into action. This can be because research findings aren't shared well, evidence is hard to locate, the evidence generated is voluminous, healthcare systems have barriers to change or resources are limited. Digital health tools can help bridge the knowledge-action gap by providing healthcare providers with up-to-date information and evidence-based guidelines. Examples include clinical decision support systems that can provide evidence-based recommendations, guidelines and alerts at the point of care. Mobile applications are now also widely available for reference and education.

4.7 Sustainability

To promote a sustainable health and social care system, we need to think about the cost, the environment and fairness. Technologies should generate benefits that outweigh costs. When selecting technologies it is important to evaluate clinical effectiveness and cost-effectiveness. This involves assessing factors such as therapeutic benefits, potential to improve health outcomes and cost relative to effectiveness compared to alternative treatments. By considering both the clinical benefits and the cost-effectiveness of a new technology a health and social care organisation can ensure that it will provide value for money and contribute to the overall health and wellbeing of the population.

We can also integrate approaches that support sustainability and reduce greenhouse gases. Healthcare organisations can reduce paper usage, implement recycling systems and select energy-efficient technology. ‘Green IT’ is the term used to refer to the use of technology in an environmentally sustainable manner and to minimise the environmental impact of IT systems. This involves energy efficiency, reducing electronic waste, responsible disposal practices and adopting other eco-friendly practices to mitigate the environmental footprint of IT infrastructure and operations. Green IT offers dual benefits of environmental sustainability and cost-efficiency. By optimising energy consumption and reducing electronic waste, health and social care organisations can lower their carbon footprint and operational expenses. Incorporating sustainability approaches not only creates value but demonstrates corporate social responsibility. Investments in energy-saving technologies and cloud-based services also provide scalability and flexibility. Green IT in healthcare includes digitising records and imaging and reducing paper. Use of cloud-based services consolidates servers, reducing energy consumption and costs. Telehealth and remote monitoring reduce patient travel, minimising carbon emissions and optimising resource use.

4.8 Case studies

In this section we provide case studies and consider the positive impact of health information technologies within the health and social care systems. The successful implementation of health and information technologies showcase value creation and the positive outcomes that can be achieved.

Each case study may have impacts on all or just some of the aspects listed above. When we apply a health information / digital technology solution to a particular issue or problem, there may be impacts and benefits in other parts of the system. For example, improving a clinical care process may positively impact patient safety and outcomes. As you read and consider the following case studies record your analysis of how the cases respond to, or have the potential to, add value to the health and social care system in the following aspects:

- Patient / resident / client safety
- Public health
- Health and social delivery of care
- Health and social care research
- Clinical processes and outcomes
- Health system sustainability and viability

Review each case study and provide your analysis of the value-add of the initiative to health and social care. Feedback is provided.

ACTIVITY: CASE STUDIES AND FEEDBACK

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4.9 Future directions

O'Reilly-Jacob et al. (2020) challenge us to consider that there is the potential for digital interventions to result in low-value care. The authors consider how a digital solution can provide suboptimal care if it is underdeveloped, when the solution supplements care rather than providing an alternative and when the solution provides unwanted care. As health service managers, we must consider how the digital solution will achieve genuine value gains for the consumer and the health and social care system.

In this section we will consider some of the future directions and challenges with a focus on:

1. Emerging technologies in health and social care
2. Anticipated challenges in the widespread adoption of technology
3. Strategies for overcoming barriers and promoting continuous improvement

Emerging technologies in health and social care

Digital technology innovations offer the potential to solve current and emerging issues in the health and social care sector. Ensuring that digital solutions add value and solve problems is a key challenge for health service managers. The COVID-19 pandemic presented challenges and opportunities for digital health technologies. A range of technologies were rapidly deployed, such as mobile phone apps for contact tracing, data analytics, chatbots, symptom reporting apps, wearables and sensors, telehealth and drones (Budd et al., 2020).

Digital health technologies add value when they solve a problem and improve care and outcomes. Key to success is having the governance and management systems to ensure the technologies applied are safe and relevant and that the data generated is protected and useful.

Source: Carlos Muza on Unsplash

The OECD has reported that:

> *The development and proliferation of digital technology represents a seismic, worldwide transformation that is comparable to previous technological revolutions. The lifeblood of this digital transformation is data. Increasingly vast amounts of electronic data related to health and wellness are produced by healthcare systems, by government and private sector services, and by individuals though daily digital activities. These data – including what is referred to as Big Data – collectively hold much potential information that can foster improvement in all healthcare system activities, from clinical care to population health, to research and development in the life sciences industry. Taken together, more intelligent use of data can go some way to realising the ideal of the 'learning health system'. (OECD, 2019, p. 214)*

Many digital technologies offer benefits to the health and social care sector such as:

- **Precision/personalised medicine / gene therapy**
- **Robotics:** robotics aids in surgery by offering precision and minimally invasive procedures; in hospitals, robots help with cleaning tasks, ensuring thoroughness and

reducing the risk of infection transmission

- **3D printing and miniature diagnostic devices:** provide rapid, point-of-care testing capabilities, supporting early detection, efficient monitoring and timely intervention; non-invasive diagnostics such as swallowable cameras and targeted drug delivery can provide real-time monitoring and treatment options with minimal discomfort or invasiveness for patients
- **MHealth, wearables; healthcare, rehabilitation and hospital in the home:** receiving rehabilitation and healthcare at home can lead to significant cost savings by reducing hospital readmissions and minimising expenses associated with hospital stays; care in a familiar environment promotes comfort, independence and faster recovery
- **AI and machine learning**

We will now touch on a few of these.

Personalised/precision medicine

The British Heart Foundation (2022) defines personalised medicine as:

> *the process of tailoring medical decisions and interventions to an individual person. It's about moving away from the one-size-fits-all approach and instead customising treatments for individuals.*

VIDEO: PRECISION MEDICINE IN ACTION

One or more interactive elements has been excluded from this version of the text. You can view them online here: https://oercollective.caul.edu.au/value-based-health-care/?p=150#oembed-1

Source: UC San Francisco (5 mins)

REFLECTION

Do you think health and medical research has made the progress expected in personalised medicine?

Where there has been progress, do you think that the health system is seeing the benefits and the value?

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://oercollective.caul.edu.au/value-based-health-care/?p=150#h5p-4

Personalised medicine can provide value for the healthcare system by averting late presentations for treatment and care, preventing adverse events, and through more targeted and responsive treatments. Examples include:

- shifting the emphasis in medicine from reaction to prevention
- predicting susceptibility to disease
- improved disease detection
- pre-empting disease progression
- customised disease-prevention strategies
- more effective prescription of medicines and drugs, including avoiding drugs with predictable side effects (Ahmed et al., 2020).

Love-Koh et al. (2018) found that three types of precision medicine are expected to emerge in clinical practice:

1. **Complex algorithms:** the use of computer algorithms to support AI and clinical decision-making. These algorithms rely on large, complex datasets containing many variables (e.g. genetic data, sociodemographic data and the clinical detail in electronic health records).
2. **Digital health applications:** primarily 'app'-based solutions to support collection of patient-generated health data (e.g. physiological measurements).
3. **'Omics'-based tests:** the use of genetic and genomic information about disease prognosis to predict treatment response. 'Omics' technology may become mainstream in healthcare (e.g. proteomics, metabolomics and lipidomics).

Precision medicine is already used:

- in cancer treatment (e.g. breast cancer, brain tumours, melanomas and leukemias)
- to treat known genetic disorders (e.g. forms of muscular dystrophy, Huntington's disease)
- to treat autoimmune disorders (e.g. rheumatoid arthritis, Crohn's disease).

Robotics

Robotics is the use of machines to perform tasks, including repetitive and complex tasks. It has been used in car manufacturing for many years; indeed many areas of manufacturing and logistics use robots. In healthcare, robotics is increasingly being applied to tasks that are repetitive or complex:

- Surgery – supporting precision and keyhole surgery
- Logistics – transporting medications, patient meals, surgical supplies
- Pathology laboratories – transporting specimens, processing large volumes of routine tests
- Treatment and rehabilitation therapies, including exoskeletons – supporting recovery from spinal and other traumatic injuries
- Patient monitoring, social and 'care' robots – supporting monitoring, social interactions and basic task completion
- Telerobotics supporting telehealth technologies
- Disinfecting devices and robotic cleaners
- Training clinical staff

Why is it important to consider how the field of robotics relates to value in digital health? From a health service management perspective, we need to consider the cost, the infrastructure required to support and integrate robotic technologies in a healthcare setting and the benefits that can be attained. For example, sensors and wireless transmissions to and from robots must not interfere with other equipment such as monitoring systems. Similarly, patient, resident and staff safety must be considered; autonomous mobile robots must not present a trip hazard. Wireless infrastructure includes robust wi-fi networks with sufficient coverage and bandwidth to support real-time communication. Secure and reliable communication protocols are essential to ensure the seamless operation of robotic systems while maintaining patient privacy and data security.

Cresswell et al. (2018) found that while there are significant opportunities for improving the safety, quality and efficiency of healthcare through robotics, there are also four major barriers that need to be effectively negotiated to realise these:

1. No clear pull from professionals and patients
2. Appearance of robots and associated expectations and concerns
3. Disruption of the way work is organised and distributed

4. New ethical and legal challenges requiring flexible liability and ethical frameworks

It is not just accommodating the hardware and software of the technologies; there is a socio-technological necessity to ensure that these technologies are integrated appropriately into the environment and the way care is provided.

3D printing

In healthcare, 3D printing has a range of current and emerging uses:

- **Tissue/bio printing:** skin, replacement organs and limbs.
- **Anatomical models:** complex anatomy 3D-printed in preparation for complex surgery so that surgeons can practice and refine techniques; to reproduce forensic anatomy; in neurosurgery 3D printing can be used to design customised implants or prosthetics for cranial reconstruction and fabricate surgical tools and guides for precise interventions.
- **Pharmaceuticals:** medicines delivered by nanotechnologies; custom-printed pharmaceutical delivery systems
- **Medical devices and instruments:** microneedles, replacement joints, biosensors (Eshkalak et al., 2020)

Eshkalak et al. (2020) summarise some of the uses of 3D printing in health and medicine in Figure 4.5.

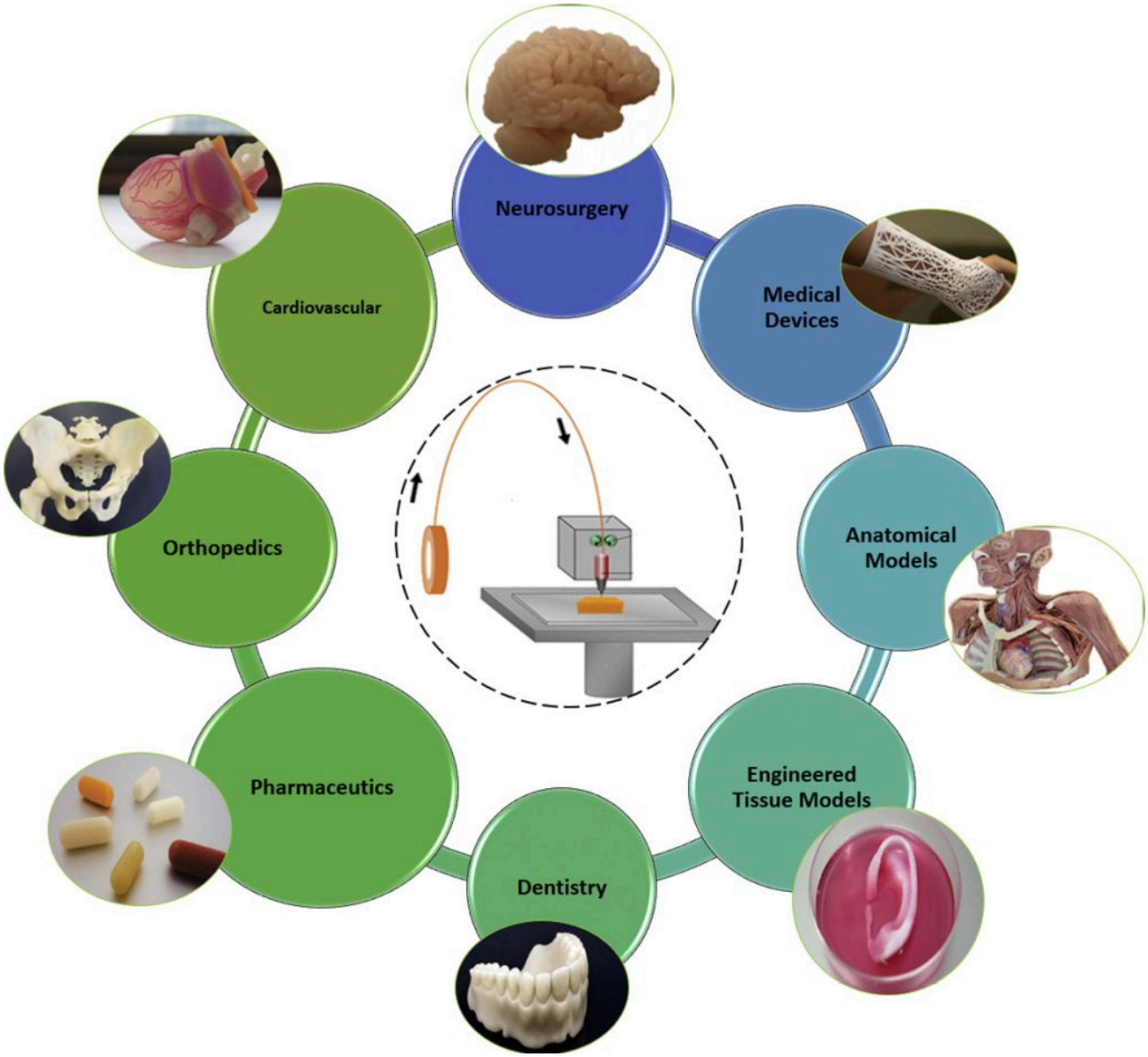

Figure 4.5: 3D printing applications
Source: Eshkalak et al. (2020). The role of three-dimensional printing in healthcare and medicine. *Materials & Design, 194*, 108940. Used under CC BY 4.0.

Eshkalak et al. (2020) explored the technical complexities for various approaches to 3D and future 4D printing, but at the centre of this innovation drive is the patient. Printing body tissues or organs relies on biometric data related to a specific patient. Similarly, printing complex surgical models (e.g. models of conjoined twins pre surgical separation) requires complex imaging . Such imaging consumes data storage and transmission capacity, making planning for long-term data management and storage a critical consideration (Eshkalak et al., 2020).

This field offers much in consumer and patient-centred care and treatments but must be governed by clear rules and solid research to ensure no harm (short or long term) is done.

Artificial intelligence

The concept of AI has been around since the mid-20th century when pioneers like Alan Turing and John McCarthy laid the theoretical groundwork. Since then, advancements in computing power, cloud computing, algorithms and data availability have propelled AI from theoretical concepts to practical applications. These include:

- reactive systems like IBM's Deep Blue, which excels at playing chess
- limited memory systems such as autonomous vehicles, which use sensor data to navigate
- theory of mind AI, demonstrated by virtual assistants like Siri and Alexa, which understand and respond to human intent
- self-aware systems like Sophia the robot, capable of interacting with humans in a lifelike manner
- artificial narrow intelligence (ANI) like recommendation systems in online shopping platforms
- artificial general intelligence (AGI) systems, which aim to exhibit human-like intelligence across a wide range of tasks
- speculative artificial superintelligence (ASI), a theoretical concept representing intelligence surpassing human capabilities, yet to be realised.
  (Joshi, 2019)

AI in health and social care presents many innovative opportunities, but with this technology come challenges and risks associated with ensuring genuine value-add in the sector. Challenges include long-term sustainability, including in infrastructures and infostructures, governance structures, and ethical and legal considerations.

FURTHER READING

If the potential for AI in healthcare is an area of interest, you may like to read this news release and a paper by Australia's CSIRO.

CSIRO report highlights 'extraordinary era' of AI in healthcare

AI trends for healthcare report

CSIRO (March 2024)

4.10 Digital transformation

A 2021 study by Appleby et al. (2021) for Deloitte identified the following key attributes of healthcare organisations undertaking digital transformation:

1. Health systems consider digital capabilities a path to fundamentally transform their relationship with consumers.
2. While the digital transformation journey is long, health systems are focusing on interim milestones to show value.
3. Talent, data and setting key performance indicators are challenges to overcome, in addition to budget.
4. An executive champion is key to digital transformation success.
   (Appelby et al., 2021)

FURTHER READING

You can read the full report on the Deloitte Insights website.

Digital transformation: From a buzzword to an imperative for health systems

Deloitte Insights (2024)

The rapid development and evolution of digital tools can tempt us to adopt the 'latest invention' to solve a particular issue. The adoption of a digital technology must align to overall enterprise-wide strategic and functional objectives and add value to how the organisation achieves its goals. For example, digital video capture of operating room procedures allows collection of useful training material. However, if the recording of patient images is not governed by policy (e.g. confidentiality) and process (e.g. how and where will images be stored) then the solution may raise more challenges and issues than it solves.

Challenges

Gopal et al. (2019) identified data and analytics as a key challenge as digital technologies collect ever more data but the capacity to analyse and synthesise may not keep pace. Gopal et al. (2019) further considered that not only is the volume of data an increasing challenge for organisations but lack of data structure inhibits data mining for analysis and research.

Challenges to achieving true and sustained value from digital technologies in health and social care are not from the evolution of the technologies but also come through broader organisational and industry issues:

- **Workforce:** what skills, training and abilities will the future health and social care workforce need to best use new and emerging technologies?
- **Changing models of care:** what are the gaps and needs in delivering patient/resident-centric models of care? How can digital health help to solve these challenges?
- **Changing health and social care systems:** the increasing divide between rich and poor and the role of digital technologies to address this; changing modes and models of care – for example, the increased use of telehealth. What might be the next digital health innovation for this mode of care provision? (e.g. What might the next evolution of virtual reality offer telehealth?)
- **Changing treatments and diseases:** how can digital technologies be applied to support changing treatments and emerging diseases?

Barriers

There are many drivers for digital innovation and adoption across the health and social care system. Desveaux et al. (2019) identified that digital health innovation relies on the following priorities for success at various levels.

At a policy level:

1. A system-level definition of innovation
2. A clear overarching mission
3. Clearly defined organisational roles

At an operational level:

1. Standardised processes
2. Shifting the emphasis to change management
3. Aligned funding structures
   (Desveaux et al., 2019)

ACTIVITY

Read the following chapters (bookmark them for future reference) and reflect on the questions below.

Making culture change happen

Mannion, R. (2022). Making culture change happen. In *Elements of improving quality and safety in healthcare*. Cambridge University Press.

Co-producing and co-designing

Robert, G., Locock, L., Williams, O., Cornwell, J., Donetto, S., & Goodrich, J. (2022). Co-producing and co-designing. In *Elements of improving quality and safety in healthcare*. Cambridge University Press.

REFLECTION

How can change be supported in complex health and social care organisations?

What are the methods for effective partnerships for co-design and co-production that are essential for digital health innovation?

An interactive H5P element has been excluded from this version of the text. You can view it online here:
https://oercollective.caul.edu.au/value-based-health-care/?p=161#h5p-2

Petracca et al. (2020) reviewed the impact of the COVID-19 pandemic on digital innovations in Italian hospitals, noting that the pandemic prompted an urgent need to implement digital solutions to a range of healthcare system challenges. The authors identified that success needs:

- reimbursement schemes
- a balance between local need and national priorities
- involvement of healthcare professionals
- coexistence of digital and analogue pathways for healthcare.

Sustained change

In the ‘post’ pandemic period, the authors found that healthcare organisations are now challenged to

sustain the momentum of digital innovation and application, noting that a sustained approach needs the following ingredients:

- Planning and design
- Policies
- Priorities
- Partnerships
  (Pettraca et al., 2020)

The future of digital health innovations is only limited by our imaginations, and the potential to solve many health issues is being progressively realised. In the time you have taken to read this chapter many new scientific discoveries and health advances have been made.

Health service managers of the present and future will be challenged to find better solutions offered by digital health that deliver measurable value to patients, organisations and the broader health and social care system.

4.11 Implications for practice

- Digital health solutions can support health workers to deliver clinical care in more efficient and effective ways.
- Identified theories and frameworks can be applied to understand digital health implementation and how to successfully implement and sustain digital health innovation.
- There are opportunities to use digital health and information systems to reduce costs, increase safety and provide access to geographically remote locations or provide the convenience of clinical consultations in the home.
- When implementing digital health solutions a focus on reducing waste, considering energy use and disposal of reusable items in a sustainable way is critical to a health industry that is a large producer of greenhouse gas emissions.
- The future of digital health is exciting, with new technologies, applications and algorithms that can transform and sustain the delivery of health and social care services.

4.12 Conclusion

Globally, there are challenges in sustaining health services due to the high costs of inputs, workforce shortages and a growing burden of chronic disease. Health information systems and technologies can support sustainability by enhancing efficiency, reducing cost and contributing to value. Through the adoption of innovative solutions such as wearable devices, advanced data analytics to provide insights, AI and robotics a range of benefits can be attained. Digital health solutions can be used to streamline workflows, optimise resource allocation and ultimately improve outcomes. Data-driven decision-making can support a more resilient and adaptable healthcare system. Using data also supports a culture of continuous improvement. Globally, there are challenges in sustaining a health workforce, and digital health solutions can be integrated to support clinicians and their work to achieve a sustainable health and social care system. Health service leaders, clinicians, policymakers, ethicists and legislators must consider the ethical considerations surrounding the use of advanced digital health technologies and this requires careful navigation to uphold privacy and autonomy, as well as address bias and equitable access, while maximising the benefits of innovation.

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Chapter 5: Data analytics and its role in managing patients

Viviane Khalil

Source: Designed by katemangostar from Freepik.

Data analytics is the science of extracting actionable knowledge and insights from many sources of available unfiltered, unstructured and crude databases (Rajaraman, 2016). The actionable acquired knowledge and insights from data processing can then be used for decision-making and prediction (Chong & Hui, 2015).

Health data availability has grown exponentially over the years (Dash et al., 2019). The introduction and expansion of information technology such as the internet, machine learning, artificial intelligence (AI), 3D printing and the advancement of different types of technologies across various industries, including healthcare, has aided in the explosion of health data. In addition to the broad availability of data, there are challenges in categorising, processing, cleaning and analysing it to make it useful in relevant settings to achieve relevant strategies (Dash et al., 2019; Saranya & Asha, 2019).

CHAPTER STRUCTURE

This chapter will explore the importance of data analytics in healthcare, the theories available to describe data analytics characteristics and modelling, and showcase three practical examples using three models for using data analytics to improve patient outcomes. Finally, the chapter will outline a summary of enablers and barriers in data analytics as well as key implications of data analytics to improve patient outcomes in practice.

5.1 Data analytics in healthcare

Data analytics offers the benefit of examining large amounts of data efficiently, facilitating data collection and sharing and identifying concealed patterns in datasets. The advancement of technologies and the internet has made available to healthcare professionals a plethora of data sources and information from various systems and platforms (Guo & Chen, 2023; WHO, 2021). These data can subsequently provide real life and timely information to facilitate clinical decisions and provide high-quality care to patients.

In healthcare, there is a vast amount of medical data of patients and systems that can be carefully analysed to lead to better diagnosis and treatment if used correctly and accurately. With the increase of electronic medical records (EMRs) in health organisations and integration with various platforms and healthcare systems in primary and secondary healthcare settings, it is likely that healthcare organisations will transition to a proactive approach for managing patients given the ease of availability of real-time patient information and hence the potential to change the model of care (Guo & Chen, 2023).

5.2 Data characteristics

Data has been differentiated into several characteristics (Gantz & Reinsel, 2011). Many articles have proposed three to five characteristics (called also ‘the Vs’ of big data), although some literature cites up to 10 (Saeed & Husamaldin, 2021) (see Figure 5.1). The expansion in characterising data among data analytics researchers is mainly due to the breadth of available data and the continuous novel sources from which to retrieve it. The main purpose of health data is to provide timely, structured and accurate information for clinicians to support their decision-making (Saeed & Husamaldin, 2021).

The Vs of data that are often described in the literature refer to volume, velocity, value and variety of available data (Fan et al., 2013). These and six further Vs are outlined below (Ranjan, 2019; Saeed & Husamaldin, 2021).

- **Volume:** the volume of data available in each industry, sector or discipline. Data volume is growing considerably, and it is anticipated that the larger the data, the better the prediction models that will be created from them and the more reliable they will be.
- **Velocity:** the speed at which data is becoming available to provide real-time decision support information.
- **Value:** the ability to turn unstructured large data into usable, meaningful information relevant to the setting in which it is required.
- **Variety:** the type, diversity and source of data available. This involves data from structured and non-structured platforms in text, graph, audio and other forms.
- **Veracity:** refers often to the accuracy and timeliness of data available. Kepner et al. (2014) highlighted the importance of accurate data and having systems in place to ensure accuracies, since it is used, for example, as a base for important clinical decisions to manage patients in health settings.
- **Validity:** the correctness and relevance of the data for the purpose needed. It also refers to the rigour, credibility and quality of data available.
- **Volatility:** refers to the rapid and unpredictable change of data and, in some settings, to its replacement by more recent data. Some industries rely on constant refreshment, with recent data replacing older data. Commercial industries, the oil sector and share markets use volatility to make daily operational decisions.
- **Variability:** the correctness and accuracy of data obtained over time. It also refers to the unpredictability and lack of consistency of data. Systems managing data variability should be able to detect skewed data for reliability.
- **Visualisation:** the graphical representation of data in any form so it is easy to identify

hidden patterns.

- **Vulnerability:** the security available for data to enable its protection and storage in accordance with relevant legislations and rules.

Some data characteristics are more relevant to specific industries than others (Anshari et al., 2019; Holmlund et al., 2020). Retail and oil and gas companies are the biggest users of most of the available data characteristics due to their dynamic environments and interdependencies on many external factors (Anshari et al., 2019, Holmlund et al., 2020).

On the other hand, in healthcare the data characteristics most frequently used are volume, velocity, variety, veracity and value (Dash et al., 2019; Saranya & Asha, 2021). When used in healthcare these characteristics can provide information that helps health services to develop, plan and implement interventions and evaluate their effectiveness (Borges do Nascimento et al., 2021; WHO, 2021). Using at least four characteristics (volume, variety, value and velocity) in healthcare provides an appreciation of the importance of the timeliness, complexity and size of available data to produce impactful change (Guo & Chen, 2023).

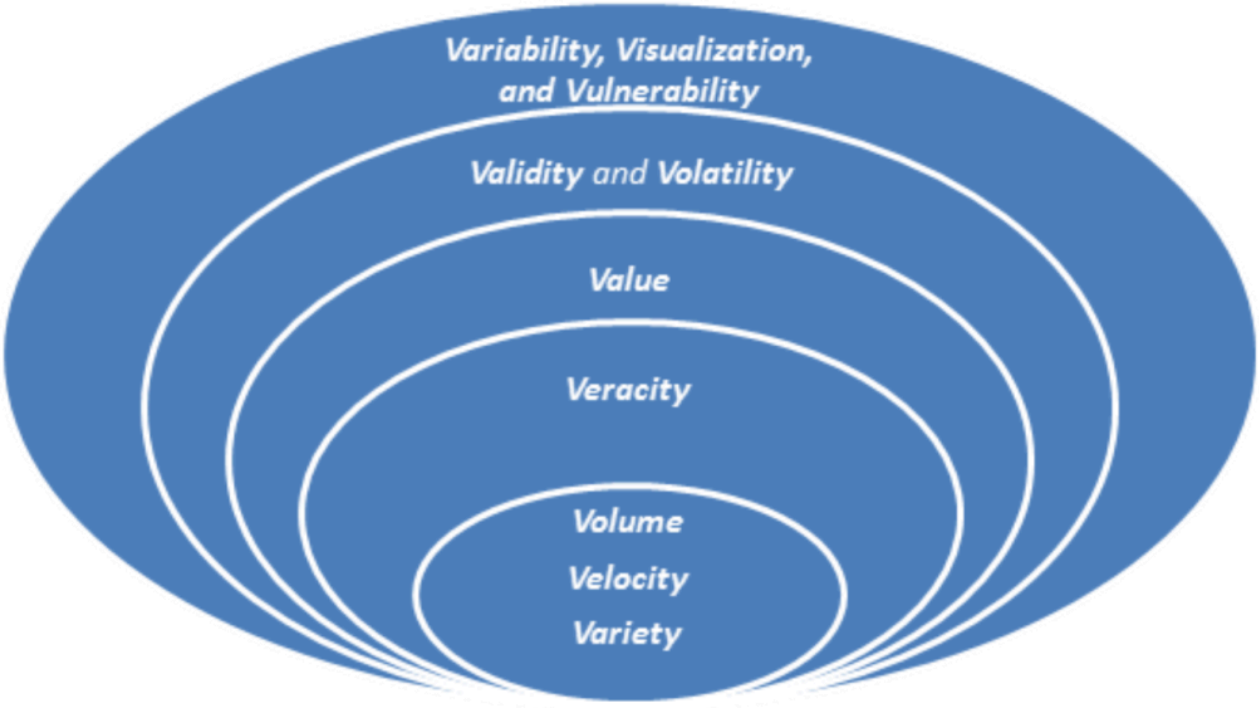

Figure 5.1: Big data characteristics (the Vs) in industry
Source: Saeed, N., & Husamaldin, L. (2021). Big data characteristics (V's) in industry. *Iraqi Journal of Industrial Research*, 8(1). Used under CC BY 4.0.

Analysing data is often done using a concept or model based on various assumptions and predictions that have been collected from previous research, experience or sometimes even from calculated or unexpected identification of relationships between various parameters of datasets (Watson, 2014). The science of data analytics has proven to be paramount in healthcare (Mehta et al., 2022). The

recent COVID-19 pandemic has demonstrated the importance of timely data to healthcare providers to ensure appropriate clinical decisions are made in a dynamic environment to improve patient outcomes, where often patients' lives are at high risk (Galetsi & Katsaliaki, 2020).

5.3 Data modelling categories

Data analytics has various modelling categories:

1. Descriptive/prescriptive data (also called 'small data')
2. Predictive modelling
3. Exploratory analytics
4. Real-time analytics
   (Blackett, 2013; Wills, 2014)

These methods allow health organisations to use raw patient and related data to support improvement in the quality of care of their patients, provide predictive modelling of progression of disease states as well as improve allocation of available resources in a proactive approach, conducting gap analysis to address organisations goals (Wills, 2014). Organisations can also adapt one or two types of data analytics to assess various aspects of performance and set goals (Chong & Hui, 2015).

Descriptive/prescriptive data

This concept includes examining a specific dataset that is collected for a solution or an improved outcome to an existing identified challenge in health service (Blackett, 2013; Wills 2014). For example, you could focus on a targeted approach in an area where high medication errors have been identified. Prescriptive analytics usually focuses on recommendations and help for decision-making. The concept helps end users to identify issues and find optimal solutions, direction and strategy (Wills, 2014).

Small data is easily retrievable in a relatively cost-effective method from electronic systems and various software and other IT databases; for example, descriptive data such as patient demographics for a particular cohort or historical data used to summarise a situation (Blackett, 2013).

This data offers invaluable information to leaders and managers across health services to easily analyse and identify patterns, trends and provide insight on patient cohorts and demographics. This information can be a source for workforce planning, strategic planning, goal setting and resource allocation to address specific demands (Kibbe & Kuraitis, 2012; Terry, 2012).

Predictive modelling

Predictive modelling includes extrapolation of current data to predict future outcomes (Ingenix, 2006). For example, in healthcare modelling can be used to target a specific group of patients

while they are inpatients to review a specific disease state and ideally prevent readmission and hospitalisation (Wills, 2014).

Exploratory analytics

Exploratory analytics includes examining a set or sets of data from various sources to yield unpredictable observations or identify unexpected correlations between various parameters. For example, in healthcare you could analyse patient feedback about their hospital stay and management during an episode of care. This type of data analytics also includes examining patient cohorts admitted for management of a specific disease.

Real-time analytics

This concept uses real-time data at the point of care to help clinicians make timely decisions for patient care, often at the bedside (Murphy, 2013). Examples of real-time analytics include identification of medication interactions through prescribing alerts at the time of medication order entry, availability of pathology and vital signs data, as well as availability of clinical decision tools such as various treatment algorithms at the point of care (Taylor, 2010).

> *The uptake of various categories of data analytics by healthcare organisations will likely have a profound impact on the quality and efficiency of models of care for the short- and long-term care of patients. (Chen et al., 2020a)*

5.4 Data analytics applications

According to the World Health Organization, data analytics applications in healthcare offer the opportunity to improve decision-making clinical skills, enact a patient-centred care approach, produce a higher quality of care, improve disease monitoring, early diagnosis and detection of health threats and risk stratification of certain medical conditions, as well as optimise health resources (WHO, 2021).

Real-life monitoring of patients provides the ability for policymakers and frontline staff to make informed and timely decisions to improve patient outcomes. In some instances, real-life patient data can be used from EMRs to provide information on readmission probability of patients with complex comorbidities. Healthcare is now focused on the prevention of hospital readmission, maintaining a community-based approach to manage health organisation resources (Suresh, 2016). Patient readmission to hospital has a large impact on hospital resources; it is often a large operating cost and can deny other patients from accessing urgent and vital care.

5.5 Case studies

The following case studies demonstrate data analytics in healthcare to manage patient outcomes and conserve health resources.

Case 1: Readmission rates

Many healthcare organisation strategic priorities now focus on preventing hospital readmission and on how to best manage patients in primary healthcare settings; this involves community-based support and outreach care to prevent hospital readmission. Suresh (2016) described a model for using available data for patients to provide a probability rating for readmission rates for each patient. The rating is available to each clinician at the point of care to inform their clinical decision-making. More specifically, data analytics can be used to provide personalised care to patients with high risk of readmission.

Suresh (2016) demonstrated that the use of readmission prediction models developed from machine learning techniques in a paediatric hospital at Pittsburgh yielded an algorithm that predicts the probability of readmission of patients with chronic diseases such as asthma exacerbations, seizures and pneumonia. The algorithm identifies these patients to treating clinicians to facilitate discharge processes and ensure appropriate services and follow-up are being considered to prevent readmission. This application of big data highlights its benefit in using a predictive modelling approach using real-life data to improve patient outcomes and health services resources.

Case 2: Pandemic response

Data analytics has been successfully used in epidemic surveillance, tracing, treatment and prevention, policymaking and resource allocation strategies. These concepts were demonstrated in the recent COVID-19 outbreak throughout the world (Hasan et al. 2023).

COVID-19 management used descriptive, predictive and perspective approaches of data analytics to provide timely real-life decision-making tools and large-scale responses to address the challenges associated with the pandemic. Tools for retrieving, processing and analysing COVID-19 data included AI, machine learning, cloud computing and improved susceptible infected models; these were instrumental in providing accurate prediction of the pandemic course (Mbunge et al., 2021; Sheela & Arun, 2022; Tuli et al., 2020; Zheng et al., 2020).

The pandemic provided an opportunity for data sharing between various countries, not just healthcare organisations within the same jurisdiction. This resulted in not only sharing available data from

various platforms and data sources but sharing of advanced technologies to process large amounts of varied data across the globe. This in turn provided real-life, timely and valuable data for frontline staff, policymakers and government bodies about finances and resource allocation (vaccines and COVID-19 therapies)

Case 3: Blood glucose monitoring

Data analytics and its integration with various software and lifestyle devices such as Fitbits, smartwatches and home blood monitoring devices offers valuable, timely information to patients, carers and clinicians in primary care settings. Salvi et al. (2020) presented a patient integration model that used advanced data analytics modelling and processing from various devices to analyse patient pathology data and couple it with their physical activities and daily eating habits to map a pattern of blood glucose fluctuations over time (see Figure 5.4). Blood glucose fluctuations for the patients were classified into various phases of control for each patient, which was demonstrated graphically to the patient and their clinicians. The data was subsequently used to modify patient treatment and lifestyle habits to optimise diabetes management.

These case studies show how an objective representation of various data types form a well-integrated system to allow better use of available data to improve patient health outcomes. This concept could be transferrable to other chronic disease conditions, such as management of hypertension and hypercholesteremia, which not only will benefit patients but will reduce drain on health resources.

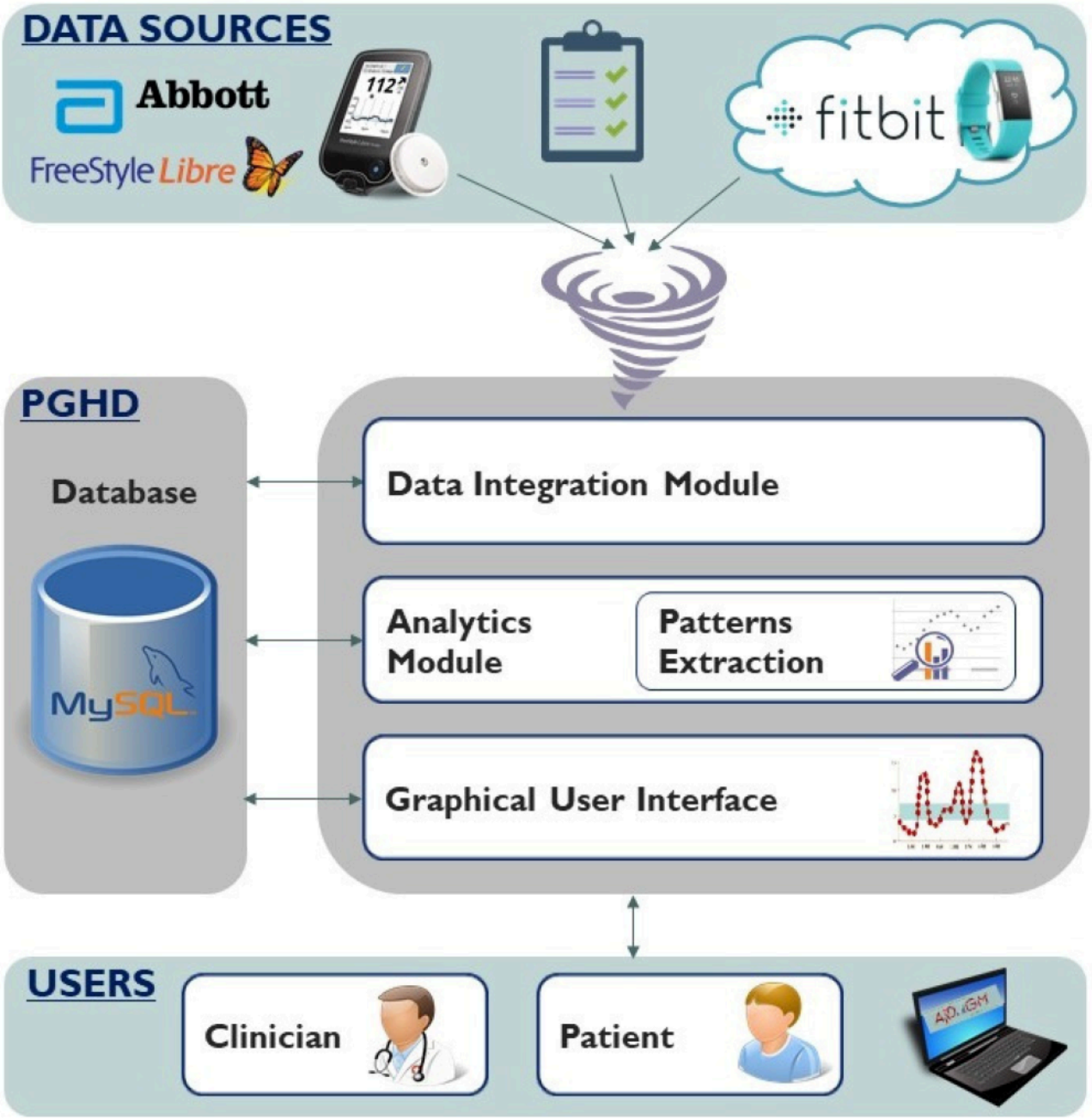

Figure 5.4: Representation of various data sources for obtaining patient pathology data and activities. Source: Salvi et al. (2019) Patient-generated health data integration and advanced analytics for diabetes management: the AID-GM Platform. Sensors, 20(1), 128. Used under CC BY 4.0.

Real-time health management

Singh et al. (2023) conducted a systematic review to provide various examples of how data analytics applications make a significant contribution to the real-time management of health outcomes and resources in various health settings.

5.6 Barriers to data analytics in healthcare

Several challenges have been cited in the literature on the use of data analytics in healthcare.

Data accuracy

Healthcare data is assembled from various resources and sometimes is entered into relevant software and data platforms by staff that do not have expertise with medically accepted terminology or language (Chen et al., 2020b). Data may be an inaccurate representation of the patient journey, especially if relying on this entry data to retrieve patient information for a specific initiative.

Fragmented patient care

Several organisations have hybrid platforms to record patient data during their inpatient stay, including transition across sites (Chen et al., 2020b; Pastorino et al., 2019). Lack of integration of software used by departments within the same organisation can lead to fragmented data entry, miscommunication and fragmented care (Chen et al., 2020b; Tan et al., 2015). This also applies to multisite organisations that have not fully implemented an electronic health record across all sites, resulting in a combination of paper-based and electronic patient data documentation.

Data privacy and security

Due to fast advancements in IT and the vast amount of data available on the web, healthcare organisations must take all necessary steps to enhance security of patient data against possible cyber breach or malware (Chen et al., 2020b). Healthcare organisations must ensure patient and staff information is protected by using up-to-date antivirus tools, multifactor authentication and encryption of sensitive data (Reddy et al., 2022).

Cost

Data retrieval is costly, especially if it involves various interfaces, analysis and processing to present it in a meaningful way to potential users (Chen et al., 2020b). Factors affecting the cost of data analytics include the type, amount and quality of data, the objectives of data analytics, vendor pricing, time taken by content experts to analyse data and customise it to meet the objectives, and organisational adaptability and readiness for change (Pastorino et al., 2019).

Human resources

The availability of suitably trained data IT analysts to manage all aspects of data can be challenging for smaller and rural health organisations (Schaeffer et al., 2017). Lack of appropriate skills and capability can present a hindrance to successful implementation of data analytics if not accounted for in workforce planning (Schaeffer et al., 2017).

5.7 Enablers of data analytics in healthcare Predictive data analytics

To overcome unstructured clean data entered into various software programs sometimes by unskilled staff, predictive medical taxonomy can be used to improve data entry quality and standardise medical terminology across various data platforms (Dubey et al., 2019).

Standardised data entry platforms

Health organisations need to leverage from available AI and machine learning software to ensure patient data is entered in a standardised format and terminology in an electronic platform that is easily retrievable and streamlined for future integration with other software.

Data governance

Healthcare organisations must provide leadership and create a digital strategy vision for their leaders and staff to follow (Reddy et al., 2022). To improve efficiency and reduce data analysis cost, organisations in the same jurisdictions could streamline their data governance principles to enhance data quality and standardise formats (Reddy et al., 2022). This will further facilitate its integration into all software across the same organisations.

Cloud data

Healthcare organisations should consider cloud data storage solutions to store sensitive data (Xu et al., 2019). Cloud servers are known for their improved multilevel security protocols for sensitive data. One of the first adopters of this storage methodology was Google, which began a database storage system back in 2003 (Ghemawat et al., 2003).

Data visualisation

Electronic dashboards are now used across many industries, including in the health sector, to turn unstructured data into interactive graphs and charts that can be understood by all levels of staff and patients regardless of background or education (Zhao-hong et al., 2018). Well-designed dashboards can often identify hidden patterns and correlations in datasets that are not easily identified unless presented as infographics or specialised maps (Zhao-hong et al., 2018).

5.8 Implications for practice

- Data analytics will become integral to patient health management as more data platforms integrate to provide real-time information for decision-making to improve patient and resource management.
- While there are restricted levels to patient information based on privacy laws in many countries, some data sources may yet miss key aspects of relevant information and may not provide the full dataset required to make informed decisions.
- Poor sampling of any dataset can produce data that is not representative of the studied populations. Organisations must be cautious about using one set of data or smaller datasets to make health outcome predictions.

5.9 Conclusion

The availability of a large amount of data in the healthcare arena from various platforms and its ease of analysis thanks to modern software offer numerous benefits to patients in remedial and preventive medicine. In addition to managing patient outcomes in real time, data analytics offers predictive modelling to conserve resources and identify patients at risk of further harm, rather than just focusing on managing current illnesses. Policymakers must ensure adequate governance of data access to protect patient privacy and balance reasonable access to be able to yield meaningful correlations without the risk of incorrect or biased results.

REFLECTION

1. From your professional experience, what are the main challenges you observe in using data analytics to enhance value-based healthcare?
2. Can you identify data analytics gaps in your organisation that if addressed could improve value-based healthcare?
3. What type of data would be useful in your practice to improve value-based healthcare?
4. In your experience, what are the key factors that contribute to the success of using data analytics to improve value-based healthcare?
5. What areas in your practice could benefit from the use of data analytics to improve value-based healthcare?
6. What strategies do you recommend to improve the use of data analytics in your practice for value-based healthcare?
7. Which category of data analytics would be more useful in your practice to provide effective value-based healthcare and why?
8. In your practice, which patient populations would benefit the most from data analytics for value-based healthcare?
9. In your practice, how does the use of data analytics improve your organisation's financial incentives?
10. How do you see healthcare delivery evolving with the widespread adoption of data analytics in your area of clinical practice, particularly in the context of value-based healthcare?

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Chapter 6: Climate change and value-based healthcare

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Incorporating value-based care approaches into evidence-based practices represents a fundamental paradigm shift in healthcare services. The value of healthcare services can be considered from the perspective of multiple tiers: individual, population and system (Dyakova et al., 2024. Building a resilient and sustainable health system is essential for ensuring universal health coverage that maximises the value of investment in health (Ranabhat et al., 2023). Healthcare services ought to minimise potential harms to patients and society at large while attempting to prevent and treat illness conditions. These harms include not only adverse events for individual patients but also negative impacts at population and environmental levels. For example, investment in a particular health area

can benefit a certain population but may deprive resources needed by other people. In the context of climate change, healthcare services may present varying values in terms of their population health benefits and their contributions to greenhouse gas emissions. There is a need to curb waste, reduce low-value care and adopt greener tools and approaches (e.g. telehealth) in delivering healthcare (WHO, 2023c).

CHAPTER STRUCTURE

This chapter will cover the following topics:

- The healthcare sector and climate change
- Health impacts of climate change
- Knowledge, attitudes and behaviours of health professionals
- Underpinning theory
- Capacity building in response to health impacts
- Building a climate-resilient health system
- Climate-resilient and sustainable health care
- Implications for practice

6.1 The healthcare sector and climate change

The healthcare industry is a significant contributor to greenhouse gas emissions, the fundamental cause of global climate change. The total greenhouse gas emissions from the healthcare sector would amount to the fifth-largest emission source on the planet if it were considered as a country, according to a report by Health Care Without Harm in collaboration with Arup (Karliner et al., 2020). The pharmaceutical sector is considered more emission-intensive than the automotive industry (Weisz et al., 2020). Internationally, the average share of the healthcare sector in carbon emissions (the predominant greenhouse gas CO2) exceeds 5 per cent (Weisz et al., 2020). It is 7 per cent in Australia (Malik et al., 2018) and Austria (Weisz et al., 2020) and 8 to 10 per cent in the US (Ebi & Hess, 2024).

The vast majority of emissions come from the healthcare supply chain: 82 per cent in the US (Eckelman et al., 2020). There is a need to examine the tools and products used throughout the value chain, from material acquisition to use and disposal. One study found that a daily intake of 650 milligrams of Active Pharmaceutical Ingredient per HIV patient is associated with annual CO2 emissions of 2.7 megatons globally (Unitaid, 2023).

Tools and products used every day in healthcare services are also vulnerable to climate-related disruptions in the manufacturing industry and supply chain. For instance, the vital antimalarial drug artemisinin, extracted from the plant *Artemisia annua*, in is short supply due to climate impacts on plant growth and flood disruptions in manufacturing in India, a major supplier worldwide. The good news is that there are technical solutions available to ensure a stable supply of the medicine while simultaneously reducing CO2 emissions without imposing additional costs (Unitaid, 2023).

6.2 Health impacts of climate change

Extensive studies have been conducted to investigate the health impacts of climate change (Barratt et al., 2022; Romanello et al., 2023; WHO, 2022a, 2022b, 2022c, 2023b, 2023c, 2024). Climate change affects health at individual and population levels, both physically and mentally (Ebi & Hess, 2024). Its health impacts result from disruptions to a wide range of social norms, encompassing environmental, social, economic, health and technological domains (Jagals & Ebi, 2021).

People have already witnessed the health impacts of climate change through extreme weather events and wildfires that lead to temperature-related illnesses such as heat stress, as well as flooding, ecological disruption and precipitation-related illnesses such as vector-borne diseases (Ebi & Hess, 2024). Older people, women and children are particularly vulnerable to these climate events events (WHO, 2015a, 2019b, 2021b, 2023b). For example, the 2023 *Lancet Countdown on health and climate change* report revealed an 85 per cent increase in heat-related deaths among people older than 65 years compared to the levels observed between 1990 and 2000, a significantly higher rate than the estimated 38 per cent growth under no climate change conditions (Romanello et al., 2023).

What is less noticeable is the increased risk of common illnesses resulting from incremental increases in ambient temperature. For example, a one-degree Celsius increase in ambient temperature is associated with a 1.05 relative risk of preterm birth and a 1.02 relative risk of cardiovascular disease related mortality (Ebi & Hess, 2024). Additionally, a one-unit increase in 'days with maximum temperatures in the 99th percentile relative to median temperature' is associated with a 1.07 relative risk of schizophrenia morbidity (Ebi & Hess, 2024). Climate change has led to the expansion of territories with temperature ranges that maximise the performance of vectors (such as mosquitoes) and pathogens (such as some Vibrio pathogens), increasing the incidence of arboviral diseases such as dengue and West Nile fever (Ebi & Hess, 2024; Romanello et al., 2023). Furthermore, climate change is accompanied by increased exposure to airborne allergenic pollen, leading to an increase in the incidence and severity of respiratory symptoms (Ebi & Hess, 2024).

Climate change is associated with food insecurity, including disruptions to food supply, quality and safety, as well as population displacement due to factors such as rising sea levels and social conflict (Ebi & Hess, 2024). Extreme drought has become more common globally, affecting 47 per cent of the land area between 2013 and 2022 compared to 18 per cent between 1951 and 1960 (Romanello et al., 2023). Additionally, extreme weather events such as floods and wildfires can disrupt transportation and supply chains (Jagals & Ebi, 2021), further jeopardising food supply. Worsening living conditions and economic losses resulting from climate change force many people to flee their homelands.

Climate change is often accompanied by air pollution, which can lead to serious health consequences,

including cancer, cognitive decline and suicide (Zhang et al., 2024). An increase of 10 µg/m³ of wildfire-specific fine particulate matter pollution (PM2.5) is associated with a 1.015 relative risk of same-day all-cause mortality (Ebi & Hess, 2024). The 2023 *Lancet* report estimated that 1.9 million deaths annually are associated with PM2.5 derived from the burning of dirty fuels, including fossil fuels and biomass, while exposure to indoor air pollution is associated with 78 deaths per 100,000 people (Romanello et al., 2023).

The changing behaviours of people because of climate change also have health implications. For example, a study conducted in China revealed that poor air quality discouraged internal migrants from visiting health facilities (Liu et al., 2022). Additionally, people may reduce outdoor physical activities in response to heatwaves (Romanello et al., 2023) and air pollution (Yu et al., 2021).

The health impacts of climate change are not equally distributed across populations. People with low socio-economic status and those living in low- and middle-income countries bear the disproportionate brunt of these impacts. Climate change detrimentally alters physical and social environments and damages health-supporting infrastructure, exacerbating poor living conditions and hindering access to healthcare in resource-poor communities (Jagals & Ebi, 2021). Globally, resource-poor countries are disproportionately impacted by climate change in terms of socio-economic development, while having the least capacity to adapt to its health effects, as their healthcare systems are already strained by the consequences of climate change (Romanello et al., 2023). In Asia and Africa, heat-related labour loss averaged 143 labour hours per worker in 2022 (Romanello et al., 2023).

In summary, climate change influences health and healthcare services through a variety of direct and indirect paths. It can lead to health losses via extreme climate events and pollution, expand the impact zones of infectious disease, exacerbate chronic physical and mental conditions, decrease quality of life, increase health and socio-economic disparities, and jeopardise the effectiveness of health efforts. Recent studies have revealed an association between climate change (increased ambient temperature) and the development of antibiotic resistance in healthcare settings (Li et al., 2023). The value of healthcare services cannot be realised without adequately addressing the challenge of climate change.

ACTIVITY

- Considering the specific context of the community you are currently living in, list at least five important health issues for women, children and the elderly that are highly sensitive to the impacts of climate change.
- How are these health issues impacting the local community?

- Describe how your local healthcare providers address these health issues. Are they well trained and prepared to cope with the challenges?

6.3 Knowledge, attitudes and behaviours of health professionals

Many health workers have become highly aware of climate-sensitive health outcomes and have tried to deliver responsive services (Yang et al., 2018). However, a shortage of knowledge about climate change can jeopardise their capacity to address the underlying causes of climate-sensitive illness conditions (Sorensen et al., 2023).

While health professionals are struggling to adapt their services in response to climate change, their awareness of the health sector's contribution to climate change is often low (Yang et al., 2018). The Health-Promoting Hospitals initiative has attempted to incorporate climate change actions into its standards (International Network of Health Promoting Hospitals and Health Services, 2020). Standard 3 'Environmental Health' requires:

- Reduced use of fossil energy through renewable energy
- Reduced water consumption through conservation, recycling and treatment measures
- Reduced climate footprint and pollution through transportation and service delivery strategies
- Reduced environmental footprint through fostering healthy eating habits and local, sustainable sourcing
- Green buildings in the design, construction and renovation of facilities

These environmental measures all have the potential to reduce costs and contribute to the value of healthcare. However, the implementation of these actions depends on strong political and leadership commitment. The health sector needs to participate in the 'responsible investment' movement driven by the United Nations (UNEPFI, 2022), which extends beyond environmental actions, necessitating changes across the entire healthcare industry.

ACTIVITY

Examine your local, regional or national health plan and identify any targets addressing the challenges of climate change. Are your political leaders committed to addressing the challenges of climate change?

6.4 Underpinning theory

Actions required in response to climate change in healthcare are guided by several intertwined theories and models. Overall, these actions follow the basic principles of mitigation, adaptation and resilience in response to climate change. Health systems can undertake mitigation efforts to reduce emissions, adaptation measures for climate change health hazards of, as well as resilience actions (Dresser et al., 2024). These principles must be embedded in health system building, addressing social determinants of health through a complex systems lens (WHO, 2022a, 2022b).

Health system building

A health system comprises multiple building blocks. According to the World Health Organization (WHO, 2010), these encompass service delivery, health workforce, health information systems, access to essential medicines, and financing and leadership/governance. None should be treated in isolation because they are inherently interconnected. A climate-resilient health system should address all the building blocks (WHO, 2020b, 2022b) (see Figure 6.1).

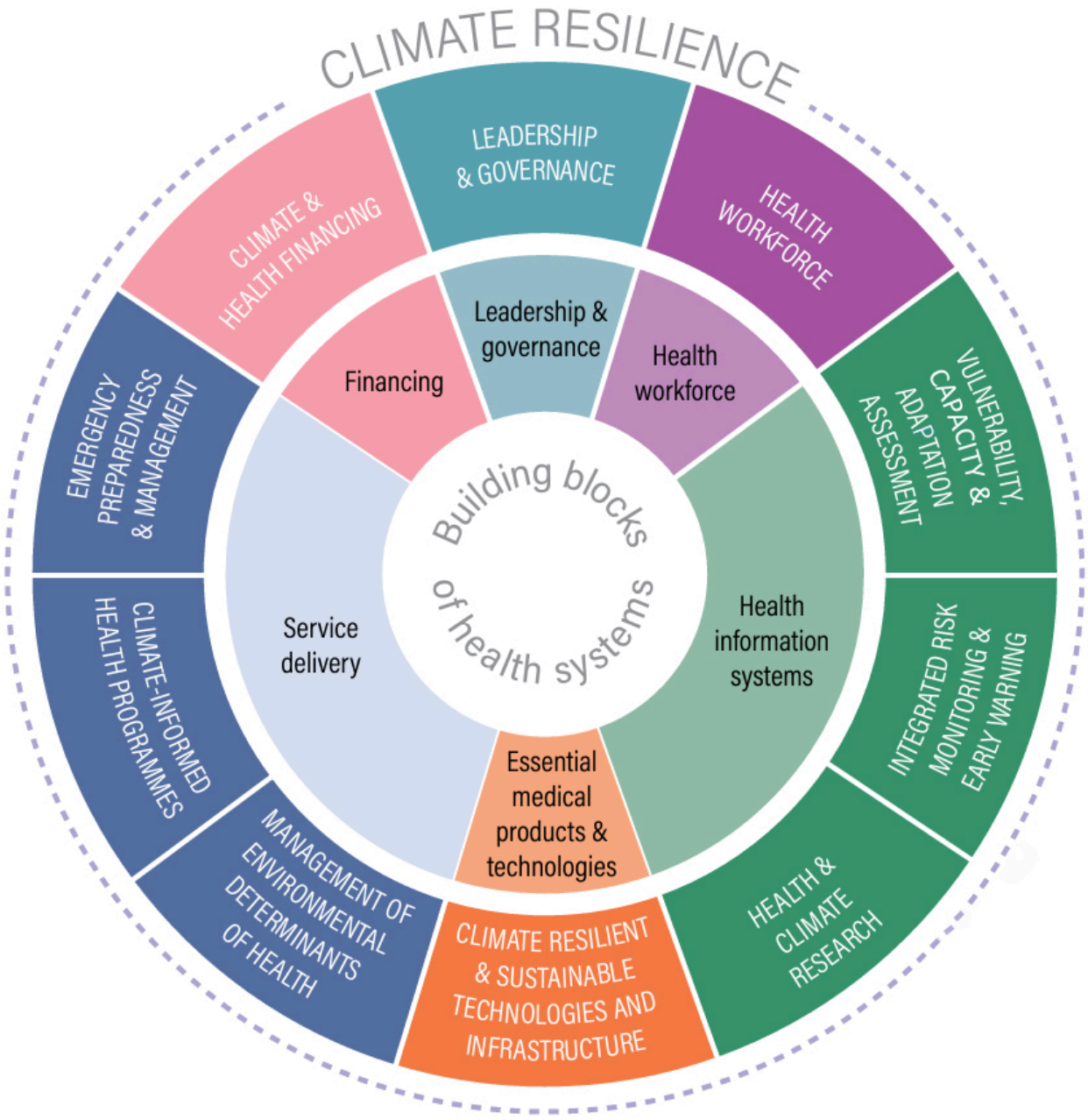

Figure 6.1: Climate-resilient health systems. Source: Adapted from *WHO guidance for climate-resilient and environmentally sustainable healthcare facilities* (82). Creative Commons CC BY-NC-SA 3.0 IGO.

International system comparisons show that a primary care dominated health system performs better than a hospital-dominated one in population health outcomes (Lawn et al., 2008). From the perspective of climate change, developing a primary care dominated health system is also critical. Hospitals are much larger contributors to greenhouse gas emissions than primary care institutions. In Austria, for example, hospitals account for 32 per cent of CO2 emissions in healthcare, compared to 18 per cent from ambulatory care (Weisz et al., 2020), highlighting the value of primary care dominated systems. Many hospital admissions can be prevented through strengthening primary care. The UK health system has been widely recognised as one of the best in the world: it has one of the lowest hospital discharge rates in OECD countries at 107 per 1,000 of population, compared with

177 in Australia and 209 in Austria (OECD, 2023). The health system in the UK accounts for only 3 per cent of the UK's carbon emissions (Pichler et al., 2019).

ACTIVITY

Identify one strength and one weakness of your local health system, respectively, in response to climate change regarding each of the five system building blocks:

- Service delivery
- Health workforce
- Health information systems
- Access to essential medicines
- Financing and leadership/governance

Social determinants of health

A range of actions can be taken to mitigate the health risks of climate change, including improving housing conditions (e.g. implementing air conditioning and air filtering systems), enhancing the community environment (by increasing green spaces), optimising service planning and delivery (through early warning systems, resource allocation and ensuring equity in access to care) and fostering cross-sector collaboration (Ebi & Hess, 2024). Many health actions, such as promoting physical activities and encouraging healthy low-carbon diets through green prescribing, can also help reduce emissions (Romanello et al., 2023). These actions align with the social determinants of health framework (Andermann, 2016).

Complex systems theory

A systems approach is needed to ensure the effectiveness of climate actions in healthcare, in which health system and service managers need to champion bold changes and work in partnership with other sectors (Andermann, 2016; Jagals & Ebi, 2021). Health outcomes are considered as a result of 'a multitude of interdependent elements within a connected whole' (Rutter et al., 2017). Jagals and Ebi (2021) propose a six-domain framework to guide the development of cross-sectoral sub-competencies and learning content for health workers:

1. **Climate and environment sciences:** factual knowledge about climate change and its key elements

2. **Drivers of climate change:** factual knowledge about the magnitude and pattern of risks
3. **Evidence, projections and assessments:** assessing and using evidence to support decisions
4. **Iterative risk management:** developing comprehensive risk management strategies and plans collaboratively
5. **Mitigation, adaptation and health co-benefits:** advocating actions
6. **Collective strategies:** harnessing international/regional/local agreements and frameworks

This six-domain framework aims to address the gap in existing education and training systems for health professionals. It is deemed essential to prepare health professionals, both those with a clinical-focused role and those with a population/environment-focused role, to ensure that healthcare services can adapt and function effectively, such as 'to anticipate, respond to, cope with, recover from, and adapt to shocks and stresses' caused by extreme weather and climate events (Jagals & Ebi, 2021).

ACTIVITY

- Do you know any climate change scientists?
- What conversations have been initiated between the climate change scientists and your local health professionals?
- Do you feel confident that your organisation understands the risks of climate change impacts and is able to conduct proper assessment on the vulnerability of your health facilities?

6.5 Capacity building in response to health impacts

Developing a collective understanding of the science behind climate change is critical for health professionals to effectively interact and collaborate with others – including government, community, private and academic sectors – in designing, monitoring and evaluating efforts to address climate-related health challenges (Jagals & Ebi, 2021). Health professionals can also learn from other industries in reducing their greenhouse gas emissions.

The WHO has issued a series of vulnerability and adaptation assessments on the health impacts of climate change. While not exhaustive, these assessments offer useful frameworks for capacity building in priority health areas sensitive to climate change, such as undernutrition (WHO, 2019b) and diarrheal diseases (WHO, 2022c). The series presents evidence of climate impacts and provides guidelines on identifying vulnerable populations and planning appropriate responses to mitigate and monitor risks over time.

CLIMATE CHANGE AND UNDERNUTRITION

Climate change affects undernutrition, including wasting, stunting, underweight and deficiencies in nutrients, by altering the conditions of 'food, care, and health' (WHO, 2019b). According to the *Technical series on adapting to climate-sensitive health impacts: Undernutrition* (WHO, 2019b), climate change is expected to result in a net increase in children suffering from undernutrition in sub-Saharan Africa, despite the positive effects of overall socio-economic development on nutrition. Both slow-onset climate events and extreme events have negative impacts on crop yields, although the impacts of extreme events may be more apparent. Globally, 80 per cent of cultivated land and 100 per cent of pasture lands are weather-dependent, making crop yields highly susceptible to climate change. The impact of climate change on nutrition is also reflected in lower access to foods (resulting in higher than normal prices of foods) and lower quality of foods. Warmer temperatures increase crop exposure to new pests and disease vectors and encourage microbial growth, which is not only toxic to ground plants and marine life but can also lead to food poisoning in humans. Pregnant women and foetuses are particularly vulnerable to heat stress. High temperatures and extreme weather events can affect appropriate care and feeding practices for infants. Undernutrition is associated with increased vulnerability to a range of diseases. Climate change may also negatively impact the interaction between patients and health providers.

CLIMATE CHANGE AND DIARRHEAL DISEASES

Sanitation and hand hygiene present significant challenges in low- and middle-income countries, contributing to a major (60 per cent) portion of the prevalence of diarrheal diseases. It is estimated that approximately 2 billion people worldwide lack access to safe drinking water (WHO, 2022c). Climate change further compounds this challenge: hot weather, flooding and droughts can all increase the prevalence of diarrheal diseases, although viruses, bacteria, protozoa and oocysts respond differently to ambient conditions such as temperature, humidity, precipitation and extreme weather events. Overall, climate change promotes the growth of pathogens in the environment and often contaminates water and food sources. Vulnerability factors include exposure to climate hazards; water, sanitation and hygiene (WASH) conditions; access to food, care and health services; adaptive and mitigation capabilities; and general health conditions.

The WHO reports mentioned above adhere to common methods outlined in the 'vulnerability and adaptation assessment' guidelines (WHO, 2021b). These guidelines recommend six steps for conducting vulnerability and adaptation assessments:

- **Step 1: Planning** – a project team needs to be established to identify key questions, define the scope of assessment, mobilise stakeholders and develop communication strategies
- **Step 2: Vulnerability assessment** – describe the health impacts of climate change and vulnerability of various populations to climate variability and predict trends in climate change
- **Step 3: Capacity assessment** – assess the capacity and current actions of health systems in responding to climate change challenges
- **Step 4: Future risk assessment** – assess the current and future health risks resulting from climate change
- **Step 5: Adaptation assessment** – assess the capacity of health systems to adapt to changes in health burdens and identify potential actions to maximise the health benefit through climate change mitigation strategies
- **Step 6: Health policy, plans and reporting mechanisms** – develop a plan to build climate-resilient health systems to better manage and monitor health risks of climate change

ACTIVITY

- What health or illness conditions are likely to be climate sensitive in your local community that warrant vulnerability and adaptation assessment?
- Have these been conducted? If not, why?

6.6 Building a climate-resilient health system

While the WHO vulnerability and adaptation assessment guidelines primarily focus on climate-sensitive disease conditions, there is a pressing need to expand the scope to encompass the overall capacity of health systems, health institutions and health workforce in addressing health challenges posed by climate change (WHO, 2020a).

Climate-resilient health systems are defined as those 'capable of anticipating, responding to, coping with, recovering from, and adapting to climate-related shocks and stresses to bring about sustained improvements in population health, despite an unstable climate' (61). Countries can assess the climate resilience of their health systems using measurement indicators proposed by the WHO (2022b).

The WHO has also introduced 10 components in its *Operational Framework for Building Climate Resilient and Low Carbon Health Systems* (WHO, 2015b, 2023c). This framework builds on the WHO's existing key commitments, such as universal health coverage, global health security and the health targets embedded in the Sustainable Development Goals in a manner that enhances the climate resilience of health systems. The objective is to enhance population health while simultaneously contributing to climate change mitigation. Neglecting to address climate change would jeopardise the achievement of these goals.

1. Climate-transformative leadership and governance

Strong government commitment and leadership are essential for establishing a climate-resilient health system. While many sectors have developed actions in response to climate change, health considerations have not always been adequately integrated into these efforts. Furthermore, health programs and policies often lack sufficient consideration of climate change and are not actively engaged in climate change processes at global, national and regional levels (WHO, 2023c). An example of progress in this area is the launch of the first National Health and Climate Strategy by the Australian government in December 2023.

2. Climate-smart health workforce

Climate change not only escalates the workload of health workers but also demands a new skill set spanning logistics support, care delivery and management of healthcare facilities. Health workers are well positioned to communicate effectively with communities about climate change and its health implications (WHO, 2023c). Unfortunately, the current education system falls short in providing the necessary training for a climate-smart health workforce. It is crucial to recognise that competent

health workers can only optimise their performance with sufficient support from their working environments (Liu et al., 2015).

3. Assessment of climate and health risks and greenhouse gas emissions

The WHO has recommended the *Climate change and health: vulnerability and adaptation assessment* tool (WHO, 2021b) for assessing the risks posed by climate change to people's health and the health system. Effective use of the tool hinges on close collaboration between academics and policy and management practitioners.

4. Integrated risk monitoring, early warning and greenhouse gas emissions tracking

This component aims to integrate climate change responses into the disease and health risk monitoring system. A climate-informed early warning system should have the capability to forecast climate-related health events and prompt early responses through effective communication channels (WHO, 2021c).

5. Health and climate research

Our current understanding of the health and health system impacts of climate change remains limited due to methodological challenges (WHO, 2023c). Boosting research capacity at local, national and global levels is crucial for monitoring and evaluating the effectiveness of climate actions, including those integrated into the health system. Equally important is translating research evidence into practice. This necessitates a multidisciplinary approach encompassing health, science, social, economic and cultural disciplines.

6. Climate-resilient and low-carbon infrastructures, technologies and supply chain

The health industry needs to adopt an innovative approach to reduce its greenhouse gas emissions throughout the entire supply chain and promote environmental sustainability in health operations. In addition to using new technologies such as virtual and telehealth services and reducing consumption, practices such as reusing (e.g. personal protective equipment) and recycling also helps emissions reduction (Bromley-Dulfano et al., 2024). Healthcare organisations can use their purchasing power to advocate for lower emissions in the supply chain. It is crucial to note that artificial intelligence consumes significant energy (de Vries, 2023).

7. Management of environmental determinants of health

Climate change poses environmental risks to health in traditional ways, such as compromised access to safe water, food and hygiene facilities, as well as newer challenges associated with extreme weather events and changing ecosystems. It exacerbates health inequities. Health workers can take strategies such as collaborating with other sectors to monitor environmental risks, raise community awareness, and prevent and manage the health consequences.

8. Climate-informed health programs

Climate-informed health programs include not only disaster risk management and public health preparedness but also initiatives targeting climate-sensitive health conditions such as malnutrition, occupational health and safety, infectious disease, non-communicable disease and injuries. Climate risks need to be factored into decision-making processes in health system development, universal health coverage, and health program planning and implementation. Unfortunately, the majority of countries have yet to integrate climate resilience into water, sanitation and hygiene (WASH) programs, which are foundational to public health (WHO, 2023a).

9. Climate-related emergency preparedness and management

Emergency preparedness and management are integral components of a climate-resilient health system, aimed at safeguarding those vulnerable to hazardous events stemming from climate change. The world has already experienced significant increases in the frequency and magnitude of climate-related emergencies and disasters. The *Health Emergency and Disaster Risk Management Framework* (WHO, 2019a) offers a rights-based, all-hazards and whole-of-society strategy for addressing climate risks.

10. Sustainable climate and health financing

Protecting health from the impacts of climate change necessitates dedicated funding for the health sector and related determinants of health. However, investing in health can yield significant cost–benefit returns from social and economic perspectives. Many developing countries face financial constraints, leading to the establishment of various global funding mechanisms (WHO, 2023c), including the Green Climate Fund (GCF), Global Environment Facility (GEF), Special Climate Change Fund (SCCF), the Least Developed Countries Fund (LDCF) and the Adaptation Fund (AF).

Case 1: Lowering greenhouse gas emissions through culling low-value care

The carbon-zero emission target endorsed by many health organisations through green energy initiatives represents significant progress in healthcare in addressing the challenge of climate change. However, it is important to note that the majority of CO2 emissions in the health industry are derived from clinical practices (Malik et al., 2018; Eckelman et al., 2020).

Wasteful and low-value care accounts for 40 per cent of CO2 emissions in clinical care. It has been estimated that 10 per cent to 40 per cent of haematology, biochemistry and immunology tests in the community are likely unnecessary, which amounts to at least 8 million requests in 2020 in Australia. Culling low-value care would reduce an equivalent of 8,000 kilotonnes of CO2 emissions per year in Australia (Barratt et al., 2022).

However, factors related to the individual provider, patient and social context can all jeopardise efforts to reduce low-value care (Dulmen et al., 2020). A systems approach is needed to address the challenge. Most de-implementation strategies are effective in reducing low-value care (Heus et al., 2023).

6.7 Climate-resilient and sustainable healthcare

Health facilities require practical tools to assess their vulnerability to climate risks and to plan corresponding actions. The WHO has developed checklists for assessing vulnerability to various climate change events, including floods, storms, sea-level rise, droughts, heatwaves, wildfires and cold waves (WHO, 2021a). These checklists evaluate the impacts of climate events on health workforce, water, sanitation, healthcare waste management, energy services, infrastructure, technologies, products and processes. They also provide recommendations for enhancing climate resilience in these areas. For instance, ensuring an adequate number of skilled human resources with decent working conditions is essential for climate resilience. Additionally, health workers need to be empowered and informed to effectively respond to environmental challenges (WHO, 2020b).

In 2017, the WHO, in collaboration with the Pan American Health Organization, introduced the Smart Hospitals Toolkit, which integrates the structural and operational safety of hospitals with green interventions (Green + Safe). This toolkit comprises the hospital safety index, the green guide and a baseline assessment tool (WHO, 2017). The hospital safety index evaluates structural, non-structural and functional factors determining a health facility's ability to operate during emergency situations. It categorises health facilities into three groups: Category A facilities are considered capable of functioning effectively during emergencies; Category B facilities can operate but have critical services at risk; Category C facilities pose risks to their clients during emergencies.

The green guide provides a checklist to help health facilities assess how they can minimise their contributions to climate change. It examines areas such as water, energy, atmosphere, indoor environmental quality, hazardous materials, pharmaceuticals, food services and waste management (see case 2). The aim is to identify low-cost measures, often non-structural, to reduce greenhouse gas emissions.

The baseline assessment tool helps to identify specific gaps in developing a smart health facility, covering components of the building/property, energy conservation, water conservation, indoor environmental quality, occupant survey and land use.

Some countries, including the US (US Department of Health and Human Services, 2014) and Canada (Health Canada, 2022; Canadian Coalition for Green Health Care, 2015), have also developed their own guidelines for constructing climate-resilient healthcare facilities.

Case 2: Healthcare waste management

Although there is a lack of a global green solution in healthcare waste management, it is clear that low technology disposal leads to harms (Kenny & Priyadarshini, 2021). Disposable consumables

benefit infection control, but their contribution to greenhouse gas emissions can no longer be ignored. In recent years, the ‘five Rs’ rule (reduce, reuse, recycle, rethink and research) has attracted increasing attention in the healthcare sector (Lattanzio et al., 2022). The Global Green and Healthy Hospitals network sustainability agenda calls for reducing toxic waste while adopting environmentally sound waste management and disposal options.

ACTIVITY

What actions have been taken in your local health organisations in relation to the ‘five Rs’?

6.8 Implications for practice

The Global Consortium on Climate and Health Education (GCCHE), composed of 320 members from health professional schools and programs worldwide, has developed core climate and health competencies for health professionals (Sorensen et al., 2023). Health professionals are advised to acquire new knowledge and skills to address the challenges posed by climate change. These include a deeper understanding of the health impacts of climate change, effective communication and collaboration with stakeholders on climate and health issues, active engagement in policy dialogues and development, and adaptation of clinical and public health practices to changing climate conditions (Sorensen et al., 2023).

The WHO recommends 17 training modules for professionals, including those in the health sector, focused on climate change and health (WHO, 2015a):

1. Introduction to weather and climate
2. Weather, climate variability and climate change
3. Population health and climate change
4. Policies and practices of mitigation and adaptation
5. Assessment and prediction of the health impacts of climate change
6. Thermal extremes
7. Extreme weather
8. Vector-borne diseases and climate change
9. Water- and food-borne diseases
10. Food security and malnutrition
11. Air quality
12. Assessing health vulnerability
13. Adaptation
14. Mitigation and co-benefits
15. Climate change at the United Nations Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC)
16. Disaster risk management
17. Communicating climate change and health

These core concepts can be further developed to meet the specific needs of health specialists, such as those working in child health (WHO, 2023b).

The WHO has recently the *Communicating on climate change and health: Toolkit for health professionals*, aiming to empower them in this area (WHO, 2024). Alongside relevant knowledge about climate change and health, health professionals are advised to:

- keep messages simple and repeat them often
- focus on human health
- pay attention to the local context
- avoid using jargon
- empower people to make informed decisions about their health
- highlight the health benefits of climate action
- use storytelling to connect with people
- refrain from using polarising language
- discuss climate change during extreme weather events
- avoid engaging in debates about the science.

These guidelines can help health professionals to effectively communicate climate change-related health risks and encourage positive actions in their communities.

ACTIVITY

Assess your own training against the WHO's recommended 17 training modules for professionals. What has been missing in your own training?

6.9 Conclusion

Climate change poses a great challenge to human health and healthcare services. Health services organisations need to take ‘mitigation, adaptation, and resilience’ strategies in response to the challenge of climate change. This requires strong leadership, systems approach, and cross-sectoral collaborations.

> *High value health care is low carbon health care.*
> *(Barratt et al., 2022)*

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Chapter 7: Low-value care

Mark Avery and Jennifer Kosiol

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In working towards and enabling value-based healthcare, which has a patient- or client-centred focus, we strive to improve patient outcomes in the context of controlling cost but promoting equality and efficiency for care and services. Critical to this values-based agenda is the need to identify, understand and mitigate low-value care.

The expression ‘low-value care’ has emerged from the broader concepts of healthcare value and value-based healthcare. Consideration and discussion about low-value care have important positions in meaning in the constructs of healthcare delivery, policy and research. The development of the narrative of low-value care aligns with key changes in important elements associated with healthcare delivery (access, equity, financing, quality and processes of care) as well as in the growth and development of evidence-based practice of care (technology, models of care and information technology). The association between an understanding and debate related to low-value care and

the growth and development of the healthcare sector is affected by the different environment and agendas related to healthcare and the geopolitical context.

The term ‘low-value care’ has been used as a way of describing medical and other direct patient and client services and interventions that have been found to have limited clinical personal benefit or that potentially create more harm or disadvantage than good. Identifying, reducing or eliminating low-value care is important to improve the quality and efficiency of service and delivery, reduce costs and economic burden, and particularly to improve patient and client care outcomes.

The use of low-value care therefore is synonymous with growth, development and change deep within healthcare provision. An example of the development of understanding and language associated with low-value care is the work by Michael Porter and Elizabeth Teisberg (Porter & Teisberg, 2006), who approach this area of knowledge development and understanding in the context of focusing on ensuring value of care and services for consumers through changes and improvements in the way healthcare systems operate.

An understanding of issues concerned with low-value care and the landscape that health managers need to operate in to achieve control and improvement are critical for the wider goals of value-based care outcomes and improvement. There is a need to deal with complexity and ambiguity in corrective change and creating improvement in this area that needs to be managed (Duckett, 2019).

CHAPTER STRUCTURE

This chapter will cover the following topics:

- Understanding and quantifying low-value care
- Underpinning theory
- Economics and value-based healthcare
- Settings for low-value healthcare
- Managing in complex environments

7.1 Understanding and quantifying low-value care

A comprehensive understanding of the concept of low-value care in health, aged and social care service delivery provides the opportunity to identify and address instances where this occurs. This is to improve the quality of care and safety for patients and clients as well as address the optimal and proportionate utilisation of finite resources throughout the healthcare system.

What is low-value care?

> *Use of an intervention where evidence suggest it confers no or very little benefit on patients, or risk of harm exceeds likely benefit, or, more broadly, the added costs of the intervention do not provide proportional added benefits. (Badgery-Parker et al., 2018)*

Ineffective and inappropriate practices

Two key aspects of understanding situations and prevalence of low-value care involve ineffectiveness and the inappropriate use of practices and services. Where clinical and service interventions lack scientific evidence of justification the issues of efficacy or the ineffectiveness of such care needs to be seriously addressed and potentially removed or changed. Certain care can be identified as not offering benefit or improvement to an individual's care and treatment and can be connected to leading to harm or adverse effects. Clinical and professional judgement is also required in terms of potential overutilisation of treatment and care where delivery of such services at higher frequency or intensity, without clear understanding of the benefits, can also constitute low-value care.

Resources (finance, workforce, consumables, time) are limited or finite at micro, meso and macro levels of the health and aged care sectors. Low-value care consumes healthcare resources and therefore is wasteful or inappropriate in terms of direct patient benefits or return on investment to a healthcare organisation or system. An important part of the agenda of dealing with low-value care is to ensure that a contemporary framework involving clinical guidelines and the practice of evidence-based medicine or clinical care is in place (Verkerk et al., 2018). The use of standards, guidelines, protocols and evidence-based medicine generally provides for identification of potential problems and issues as well as giving guidance around dealing with variability in clinical practices among healthcare providers within health systems. From these frameworks and guidance methods for dealing with low-value care, actions can be determined and referenced in order to deal with the issues of low-value care in practice and delivery.

The preferences of patients, clients and consumers are an important part of dealing with the complex issues of low-value care; patient preferences, understanding and values may not align with practice recommendations and the provision of care by healthcare professionals. There is a necessary correlation between patient and consumer information education and decision-making support within the agenda of dealing with low-value care.

Identifying low-value care

Several quantitative and qualitative methods or approaches can be used to identify and present situations and occurrences where low-value care may exist (Parker et al., 2022). Identification and articulation of patient care service outcomes, enabling an evaluation of results and impact of care following the receipt of clinical interventions, lets us determine whether benefits outweigh risks and costs. Services that do not result in improved patient health or quality of life can be indicative of low-value care. Associated with outcomes is the study of utilisation rates with analysis of specific clinical services, diagnostic tests or procedures and published clinical guidelines or evidence-based recommendations for practice and service delivery. Services provided at a higher rate than appropriate or necessary based on clinical evidence and practice guidelines can also indicate low-value care. Optimal review and assessment in the identification of low-value care probably involves several methods, to triangulate or provide granular evidence where low-value care might present. Monitoring an agreed set of performance indicators related to quality, safety, efficiency and efficacy enables the identification of practices, procedures and areas of improvement to reduce situations and circumstances of low-value care, to enhance the continuum of care provided to patients and consumers.

7.2 Underpinning theory

Many frameworks, theories and models provide useful conceptual constructs as well as practical approaches to identify, measure and engage strategically to reduce low-value care in health and aged care systems. Using these constructs can provide benchmarks and references to optimise value and quality decision-making at specific and general health system delivery levels. From these constructs appropriate interventions for reducing low-value care can be developed (Parker et al., 2022).

A number of theoretical frameworks in health services research and management help managers and clinicians determine low-value care, such as patient characteristics and behaviour, organisational factors, and external influences on individual practice and the operation of health service delivery organisations. Donabedian's model on healthcare quality (Donabedian, 2005), Anderson's behavioural model of health services use (Alkhawaldeh et al., 2023) and the diffusion of innovations theory (Dearing & Cox, 2018) are useful in fact-finding and crystallisation of information to support decision-making or change management processes.

Value-based healthcare

A useful perspective and opportunity to examine the impact and value of service delivery comes from the value-based healthcare model (Lewis et al., 2023), which examines and emphasises optimal outcomes for patients relative to the costs involved in care and service delivery. This model aligns financial incentives with concepts of quality and value in the focus on patient-centred care. The concept of value-based healthcare is directed to the reduction of low-value care by providing incentives to individual providers and health organisations to deliver high-quality cost-effective services and interventions through the engagement of patients, clients and consumers in shared decision-making.

Several practical and applied frameworks for understanding and acting on the reduction or elimination of low-value care are emerging nationally and internationally. The Choosing Wisely Australia strategy (see box text) is part of an international agenda that focuses on understanding, change and reform to minimise or eliminate low-value care in day-to-day clinical practice and service delivery. Collectively, professional bodies and organisations within health services focus entirely or incorporate important components of their agendas around standards development, provision of practices service delivery guidelines and reporting and benchmarking opportunities. The Royal Australian College of Physicians EVOLVE program (see box text) helps professions to identify significant incidents of low-value care and provides guidance and frameworks to deal with them.

CHOOSING WISELY AUSTRALIA

The Choosing Wisely Australia initiative is a health profession led engagement strategy aimed at promoting and developing a national dialogue about unnecessary tests, treatments and procedures. It focuses on supporting and enabling people to make healthcare choices and decisions based on evidence, necessity and strategies to reduce harm to individuals. The initiative and its activities are supported by professional colleges in healthcare, societies, associations and agencies that are involved in many aspects of quality, risk and safety in healthcare. The Choosing Wisely initiative began in the US in 2012, and the agenda and activities are now found in a number of countries throughout the world.

The Choosing Wisely Australia website (hosted by the Australian Commission on Safety and Quality in Healthcare) provides a range of information, evidence and discussion and an opportunity for individuals or groups to engage in the concepts promoted by this initiative.

ROYAL AUSTRALIAN COLLEGE OF PHYSICIANS EVOLVE INITIATIVE

The Royal Australian College of Physicians (RACP) EVOLVE initiative aims to reduce the provision of low-value care by empowering physicians to take the lead in transforming clinical practices, thereby enhancing patient care, fostering improved decision-making and optimising resource use. EVOLVE focuses on the 'Top 5' clinical practices that may be overused, provide little or no benefit or could cause harm for patients. Sponsored and facilitated by RACP, EVOLVE supports and enables physicians to take a key leadership role in changing clinical behaviour to enable better decision-making and, ultimately, appropriate and proportionate use of resources in clinical care.

The EVOLVE Top 5 methodology gives clinicians and those working in low-value care identification and change a framework that has been tested and which supports the development, refinement and finalisation of identified low-value practices in healthcare to create an action agenda for improvement and change.

7.3 Economics and value-based healthcare

The examination of low-value care through the lens of health economics is a fundamental and important way of looking at these issues. Health economics examines the way that scarce resources are allocated and used within the healthcare system and services. Economics is one of several social sciences that are used to understand and predict human behaviour; this is relevant within health and for those who need any use healthcare (Morris et al., 2012). Through the lens of health economics, we look broadly at key issues of resource allocation where low-value care is about misallocation of resources that do not provide optimal benefit to patients or consumers. Economics also provides a range of key evaluation methods such as cost–benefit analysis, which examines the relationship between costs and benefits associated with a particular healthcare intervention.

Understanding value

Value refers to the optimisation or maximisation of health outcomes relative to the costs and resources that need to be used in delivering interventions. It considers clinical effectiveness, cost-effectiveness, patient preferences and resource allocation efficiency. Value articulates or explains the health improvements that can be achieved with the allocation of resources to patient care (Lakdawalla et al., 2018).

Quantification methods

In relation to low-value care there are several techniques that measure the impact and extent of outcomes related to clinical care and health services where there is little or no benefit. Techniques include cost-effectiveness evaluation; patient and client outcomes evaluation, examination of practice and service delivery variations and considering the use and impact of incentives in health delivery. Quantification of situations related to low-value care enables targeted and planned responses, to reduce incidents and practices of low-value care, optimise resource allocation and improve service delivery outcomes (Sacristán, 2020).

Value for money studies

A value for money study is a method that considers quantitative information (cost-effective ratios, return on investment, consumer satisfaction) and examines what resourcing allocated to a particular treatment or care actually provides in terms of the outcome and impact delivered.

Cost drivers and studies

Cost drivers are factors or influences that affect and change costs and expenses associated with delivering patient and consumer care. Examples include technology, labour costs, pharmaceutical costs, cost of quality assurance and regulatory compliance, patients and consumers, as well as incident rates for disease and injury in a community. Understanding and controlling cost drivers enables effective management of funding and other resources and is therefore a significant factor in identifying and managing low-value care.

Uncertainty

Uncertainty refers to lack of optimal knowledge and therefore predictability of outcomes and events (Briggs & Gray, 1999). Uncertainty arises when health managers have incomplete information, operate in ambiguous situations and cannot foresee events that could impact economic outcomes. Examples include changes to and availability of technology, shifts in government policy and reactions within human behaviour. A key and important response to dealing with low-value care in uncertain situations and conditions is to gather information (actual and predictive) to support economic modelling that can assess the impact of uncertain factors and economic behaviour in care and service delivery.

7.4 Settings for low-value healthcare

Low-value care focuses on issues of quality and effectiveness of direct care to patients, clients, residents and other health service consumers. The context in which issues of low-value care might be identified come through an examination of direct services provided but also in a wider context that health and aged care organisations systemically and in relation to education, training and knowledge can also be in a position to enable value-care activities to take place. Low-value care can occur in various settings and situations in the health system and can be related to procedures and interventions, diagnostic testing and medication prescribing, and in end-of-life care related to issues of demonstrable meaningful benefit for terminally ill patients and residents. Low-value care can also be present in preventative services where there is a lack of evidence regarding activities related to communities and wider populations, such as unnecessary health screenings or interventions.

Direct and indirect drivers

Direct and indirect drivers enable low-value care and affect training, experience and culture of practice. This allows for variability in clinical decision-making and therefore in patient and client care delivery (Verkerk et al., 2022). A lack of consistent delivery guidelines, protocols and standards of practice (which could be affected by the sheer volume of knowledge and learning transfer that occurs within a health system and health practice) along with available time for practitioners to individually and collectively consider best practice is problematic.

Different funding allocation models can create financial incentives to act and provide care in certain ways, such as fee-for-service reimbursement that can overemphasise the volume of care provided to patients and clients rather than key issues of quality and value of care.

The legal framework of health services can cause situations where tests and interventions are requested in order to mitigate real or perceived legal liability in patient care. Poor or inadequate care coordination and weak use of available resources such as health informatics create fragmented care delivery.

Risk management

A number of risk management strategies can be used to deal with specific low-value care situations as well as the environments where low-value care might exist (Halligan et al., 2023). Strong and effective risk management involves the collaborative development of clinical guidelines to document issues, situations and drivers related to low-value care and to provide evidence and optimal practice guidelines for clinicians. Clinicians and system managers can use a range of decision support

tools to measure achievement and compliance to standards, guidelines, protocols and best practice indicators in relation to low-value care identification and responsive action. The objective is to use contemporary information, knowledge and education strategies and approaches to provide support for the alignment of care with contemporary practice knowledge. Such strategies have potential and practical ability to reduce prevalence of low-value care and therefore improve quality of care and optimisation of the use of health resources.

7.5 Managing in complex environments

It is vital to manage organisations, systems, models of care and service delivery to effectively identify and deal with circumstances of low-value care within the complexity of the health and aged care delivery continuum. Management areas include knowledge translation use and contribution to clinical care standards, protocols and models of care benchmarking; monitoring and evaluation; education and training; shared decision-making between clinicians and patients; health economic levers and environments that involve funding and payment models; and fostering cultures of accountability and continuous quality improvement.

Leadership

Leaders and managers in healthcare play a critical role in supporting and enabling specific and systematic responses to circumstances of potential delivery of low-value care in their organisations. Fundamental to those responsibilities is the ability to articulate a strong set of goals and objectives about quality, effectiveness and resource management responsibilities. Health system leaders need to foster a culture of transparency and accountability and promote a comprehensive and deep sense of quality assurance within and external to the organisation (Votova et al., 2019). To promote and incentivise high-value care requires a commitment to patient-centred care, continuous quality improvement and strong cost awareness in decision-making.

Culture, reform and change

To engage effectively around dealing with issues of low-value care, practitioners and teams need to create an environment of contemporary practice, reform practice and systems and pursue authentic change management. Encouraging healthcare providers and organisations to prioritise evidence-based practice and contemporary clinical pathway decision-making fosters a culture where the latest research and knowledge directly informs care delivery practice. Translation sciences offer a range of models and methods to help bring contemporary and new knowledge into practice and enable effective and efficient education and training programs to equip healthcare professionals with new knowledge and skills to identify and reduce low-value care through critical appraisal and shared decision-making.

Organisational improvement

Teams and health organisations can focus on improvement by enabling a culture of continuous learning and quality. This encourages shared decision-making between clinical practitioners and also

in their relationships with patients and clients. Interdisciplinary professional collaboration enables a whole-of-practice approach to direct care and provides a strong environment to support individuals as they take on new and justified ways of providing direct care.

7.6 Conclusion

Given the dynamic nature of health and aged care service delivery and the continuous flow of information within small, medium and large health and aged care organisations there is a need for contemporary and robust plans and strategies to identify the role of low-value care in a quality landscape and plans for direct care assurance and improvement.

A contemporary understanding of low-value care is essential for continuous improvement to support high-value patient and client care. This approach allows internal and external stakeholders to be aware of the quality landscape, identify wasteful practices and optimise resource allocation to guidelines and protocols that enhance the value and efficiency of care delivery.

7.7 Case studies

Case 1: Clinical judgement

In dynamic healthcare delivery, there is requirement in balancing clinical judgement with evidence-based guidelines, practitioner beliefs, patient preferences, and avoiding low-value care to ensure patient-centred outcomes.

Dr Serena Hawthorne firmly believed in the necessity of a particular service despite it being identified and agreed as of low value within published clinical guidelines. A patient presented with chronic low back pain, and Dr Hawthorne recommended frequent magnetic resonance imaging (MRI) scans to monitor the progression of the condition. Despite the available evidence-based guidelines suggesting limited utility of frequent imaging for such cases, Dr Hawthorne insisted on its necessity to ensure comprehensive monitoring and timely intervention. The patient felt that this was appropriate and useful and agreed to meet the cost of any gap payments against social and voluntary health insurance or for total costs of the MRI monitoring.

Dr Hawthorne's rationale stemmed from a deeply ingrained belief in personalised patient care and a commitment to thoroughness in diagnosis and treatment. Despite efforts by colleagues (general and specialist practitioners) to advocate for alternative, evidence-based approaches, Dr Hawthorne remained convinced of the service's value, citing previous instances in her practice where early detection had led to successful interventions.

There is a complex interplay between clinical judgement, individual practitioner beliefs and evidence-based practice in healthcare delivery. This highlights the importance of ongoing education and dialogue within clinical teams to address variations in practice and promote the delivery of high-value care aligned with best evidence and patient-centred principles.

ACTIVITY

What approaches, over what timeframes, might be used to support development and change relating to individual practice in the context of new evidence-based practice guidelines?

Case 2: Residential aged care

Contemporary care involves integrating resident needs with evidence-based practices, reducing low-value care, and emphasising staff education, multidisciplinary collaboration and family engagement to enhance care quality.

At the Golden Haven Seniors' Residence residential aged care facility, several residents were receiving low-value care, despite the facility's commitment to quality service. At Golden Haven there was routine administration of unnecessary medications to manage mild symptoms of anxiety and insomnia. Despite evidence suggesting non-pharmacological interventions such as alternative sleep hygiene strategies, engagement with residents to partner with the view of establishing preferred sleep routines, cognitive behavioural therapy and environmental modifications as more appropriate first-line treatments, Golden Haven persisted in medication-centred approaches.

Golden Haven staff's approach and justifications stemmed from a combination of factors, including time constraints, limited access to mental health specialists and a reliance on 'quick' pharmacological interventions. Additionally, family members occasionally requested medication to alleviate perceived distress in their family members.

Aged care facilities face significant challenges in balancing resident care needs with evidence-based practices. This highlights the importance of ongoing staff education, multidisciplinary collaboration and family engagement to ensure the provision of high-value, person-centred care in geriatric settings.

ACTIVITY

How can care organisations and services address practice changes when faced with limited resources (time, expertise, funding) to support carers in the provision of high-value care?

ACTIVITY

1. Identify from publications an identified low-value healthcare activity. List all direct and indirect costs associated with that service. Estimate the total cost and identify

opportunities for cost reduction through evidence-based alternatives.

2. Compare patient outcomes from a low-value healthcare service to those from evidence-based alternatives. Analyse the cost-effectiveness and potential benefits of eliminating the identified low-value practices.

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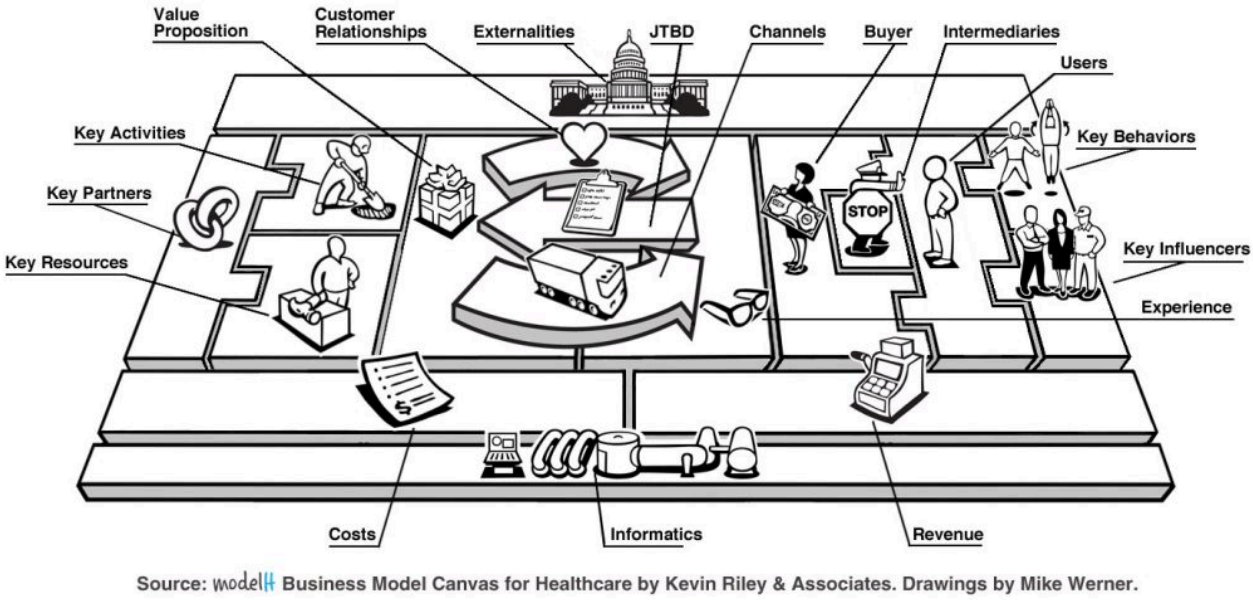
Chapter 8: Evaluating the effects of healthcare programs and interventions

Dr Jennifer Kosiol and Dr Mark Avery



Business model canvas for healthcare. Source: Kevin Riley and Associates. Drawing by Mike Werner from Wikimedia Commons used under CC BY-SA 3.0.

Evaluating the effects of programs and interventions aimed at reducing low-value healthcare is essential for ensuring patient safety, improving healthcare quality, making efficient use of resources, and informing policy and clinical practice. Evaluation is a critical component in the ongoing effort to make healthcare systems more effective, efficient and patient centred. This chapter delves into the complexities of assessing the effects of such interventions, exploring the theoretical frameworks, evaluation designs and methodological considerations essential for a comprehensive evaluation. By examining the implications of low-value care on healthcare systems, providers and patients, this chapter provides insights into the importance of evaluating and improving interventions to enhance the quality and efficiency of healthcare delivery.

CHAPTER STRUCTURE

This chapter will cover the following topics:

- Low-value care evaluation
    - Prevalence and types of low-value care
    - Implications of low-value care for healthcare systems, providers and patients
- Evaluating low-value care programs and interventions
    - Why evaluation is necessary
    - Theoretical models and frameworks
    - De-implementation
- Implications for practice
    - Policy implications
    - Policy recommendations

8.1 Low-value care evaluation

The primary goal of healthcare is to benefit patients. Evaluations help ensure that care being provided is beneficial and not harmful (Owens et al., 2011). In the context of low-value care, where risks can outweigh benefits, this is critical. Effective evaluation helps to refine healthcare interventions to maximise patient safety and treatment efficacy. Low-value care refers to medical tests, procedures and treatments that provide little or no benefit to patients in specific clinical scenarios and, in some cases, may even cause harm (Colla et al., 2017). This concept extends to interventions that, when weighed against their potential risks, costs and the availability of more effective alternatives, are deemed unnecessary or inefficient. Low-value care can arise from overdiagnosis, underdiagnosis, overtreatment, undertreatment or practices that have been superseded by newer, evidence-based approaches.

Prevalence and types

Low-value care encompasses a broad spectrum of services, including diagnostic tests, medical treatments and surgical procedures (see Table 8.1). The prevalence of low-value care varies widely depending on the healthcare system, the specific types of care considered and the methodologies used for measurement.

Table 8.1: Types and examples of low-value care

Type	Example
Imaging tests	**Unnecessary imaging tests for acute low back pain within the first six weeks without specific indications (O'Reilly-Jacob et al., 2019; Wami et al., 2019)**
Antibiotic prescriptions	**Prescribing antibiotics for viral upper respiratory infections where they are ineffective (Park et al., 2022)**
Screening and testing	**Overuse of screening tests in populations where the benefit is minimal such as prostate-specific antigen (PSA) testing for prostate cancer in men of certain ages (Gillette et al., 2023) or bone density (DEXA) scanning for osteoporosis in women under 65 without risk factors (Jeremiah et al., 2015)**
Surgical procedures	**Performing elective knee arthroscopy for osteoarthritis has been shown to have minimal benefit over conservative management (Berlin et al., 2020)**

Studies across different countries and healthcare settings have reported varying rates of low-value care. For example, in the US it's estimated that a significant portion of healthcare spending is on services that do not improve patient outcomes (Owens et al., 2011).

The prevalence of low-value care in Japan was examined in a multicentre observational study involving 345,564 patients seeking care at acute care hospitals in 2019 (Miyawaki et al., 2022). The study identified 33 low-value care services occurring in 7.5 per cent of the population, which resulted in 0.5 per cent of overall annual healthcare spending. The study estimated that at least ¥100 billion (approximately US$650 million) of medical overuse occurs annually in Japan, highlighting the considerable resources consumed by and economic impact of low-value care in the universal healthcare system.

A study in the US that focused on the prevalence of low-value prostate cancer screening in primary care clinics aimed to identify the proportion of primary care visits where low-value prostate-specific antigens (PSAs) and digital rectal exams (DREs) are ordered, as well as the characteristics associated with this practice (Gillette et al., 2023). The study found that the use of low-value PSAs and DREs was significant during the observed period, and the number of services ordered by primary care providers increased the likelihood of ordering low-value PSAs and performing low-value DREs. The study suggested that organisations looking to reduce the use of low-value prostate cancer screening should focus interventions on providers who order a high number of tests (Gillette et al., 2023).

Similarly in Germany a study that looked at the prevalence of low-value care in people with dementia found that the prevalence of low-value care was high , with 31 per cent of the study population receiving low-value care (Platen et al., 2021). The study also found that patients with dementia who received low-value care had a significantly low quality of life and were more likely to be hospitalised compared to those who did not receive low-value care.

In Australia, one study identified 156 potentially ineffective or unsafe non-pharmaceutical services listed on the Australian Medicare Benefits Schedule (Elshaugh et al., 2012). This effort, aimed at evaluating low-value care, used a multiplatform approach, including literature reviews and expert consultations. The findings serve as a basis for further clinical evaluation and prioritisation within health technology reassessment initiatives, emphasising the need for a systematic and evidence-based approach to identifying and reducing low-value care in the healthcare system.

FURTHER READING

For more detail on this Australian analysis, read the full study on the *Medical Journal of Australia* website.

Over 150 potentially low-value health care practices: an Australian study

Elshaugh, A. G., Watt, A. M., Munday, L., & Willis, C. (2012). Over 150 potentially low-value health care practices: an Australian study. *Medical Journal of Australia*, *197*(10), 556–560.

Recent studies in New South Wales (NSW), Australia, have contributed significantly to the

understanding of low-value care in public hospitals (Badgery-Parker et al., 2019a). One study analysed hospital-admitted patient data across seven financial years (2010–2011 to 2016–2017), focusing on 27 procedures identified as potentially low value based on international and Australian recommendations. This study found that in the financial year 2016–2017 between 5,079 and 8,855 episodes of care were deemed low value, accounting for 11.0 per cent to 19.2 per cent of all procedures analysed. The total cost associated with these episodes of low-value care was estimated to be between A$49.9 million and A$99.3 million, indicating a significant financial impact on the healthcare system.

Another study investigated hospital characteristics associated with low-value care, aiming to understand factors contributing to variation in its provision (Badgery-Parker et al., 2019b). This research, which focused on seven low-value procedures, found little association between hospital characteristics and rates of low-value care, suggesting that low-value care is not a general property of hospitals in NSW. Instead, variations by procedure within hospitals were observed. The study highlighted the complexity of addressing low-value care and suggested that understanding its drivers might require examining the knowledge and attitudes of the clinicians who provide these procedures.

These findings underscore the prevalence and financial implications of low-value care for healthcare systems, providers and patients. The studies also emphasise the importance of considering procedure-specific variations and clinician-related factors in efforts to reduce low-value care.

Implications for healthcare systems, providers and patients

- **Healthcare systems:** Low-value care contributes to escalating healthcare costs without corresponding improvements in patient outcomes. It diverts resources away from high-value, necessary care, affecting the overall efficiency and sustainability of healthcare systems (Schwartz et al., 2014). Additionally, low-value care can exacerbate issues related to healthcare access and equity, as funds wasted on low-value care could be better used.
- **Providers:** For healthcare providers, engaging in low-value care can lead to professional dissatisfaction, especially when practitioners are aware of the mismatch between the care provided and the best evidence-based practices (Colla et al., 2015). It may also expose providers to increased risk of legal liability and damage to their professional reputation, especially in cases where low-value care results in patient harm.
- **Patients:** From the patient perspective, low-value care can lead to unnecessary financial burden due to out-of-pocket expenses for ineffective treatments (Colla et al., 2017). More importantly, it poses health risks, including potential side effects from unnecessary medication, complications from unwarranted procedures, and the psychological impact of overdiagnosis (Schwartz et al., 2014). It can also lead to misallocation of the patients' time and focus away from interventions that could genuinely improve their health

outcomes.

8.2 Evaluating low-value care programs and interventions

Evaluating programs and interventions designed to reduce low-value care is crucial for several reasons (see Table 8.2). Firstly, such evaluations facilitate the identification of inefficacies and inefficiencies in healthcare systems, enabling targeted improvements that enhance patient outcomes and safety. By scrutinising the effectiveness of various interventions aimed at minimising practices that offer little to no benefit to patients, healthcare providers can redirect resources towards more impactful and evidence-based care strategies (Ganguli et al., 2021). Secondly, from an economic perspective, the reduction of low-value care can lead to significant cost savings for healthcare systems, which is particularly crucial in an era of escalating healthcare expenditure (Elliott et al., 2021). These savings can then be reallocated to areas of higher need, thereby improving the overall equity and accessibility of healthcare services. Finally, evaluating these programs supports the cultivation of a culture of continuous quality improvement and evidence-based practice among healthcare professionals, fostering a more judicious use of healthcare resources (D'Avena et al., 2020). Ultimately the rigorous assessment of interventions designed to curtail low-value care is essential for advancing healthcare quality, optimising resource utilisation, and ensuring that patient care is effective and efficient.

Table 8.2: Importance of evaluating programs and interventions to reduce low-value care

Evaluation	Improvement
Effectiveness assessment	**Evaluation helps determine whether specific interventions are effective in reducing the incidence of low-value care within healthcare systems. It identifies which strategies work best in particular contexts or populations, facilitating the replication of successful approaches.**
Resource optimisation	**By identifying the most cost-effective strategies for reducing low-value care, evaluations can guide the allocation of healthcare resources toward interventions that offer the greatest benefit in terms of improved patient outcomes and system efficiency.**
Informing policy and practice	**Evaluation findings can inform healthcare policy, guiding the development of guidelines, reimbursement models and quality improvement initiatives that discourage low-value practices and promote high-value care.**
Enhancing patient care	**Ultimately the goal of reducing low-value care is to improve patient care. Evaluations help ensure that interventions not only reduce unnecessary or harmful practices but also enhance patient satisfaction, safety and outcomes.**
Continuous improvement	**Evaluations provide feedback that can be used for the continuous refinement and improvement of interventions. This iterative process is essential in the dynamic filed of healthcare, where new evidence and technologies constantly emerge.**

Low-value care has significant negative implications for healthcare systems, providers and patients, making the evaluations of reduction efforts a critical endeavour. Such evaluations are key to ensuring that healthcare practices are aligned with the latest evidence, optimising the use of resources, and ultimately improving patient care and outcomes.

Why evaluation is necessary

The quality of healthcare delivery is closely tied to the prevalence of low-value care, which includes medical procedures and treatments that provide minimal or no benefit to patients. Such practices can detrimentally impact the overall quality of healthcare services by diverting resources away from more effective care and potentially exposing patients to unnecessary risks (D'Avena et al., 2020). To enhance healthcare quality, it is essential to evaluate interventions with the aim of discovering and reducing low-value care. These evaluations help to pinpoint ineffective or redundant practices and determine the best strategies to eliminate them. By systematically assessing and minimising health interventions, healthcare systems can ensure that the care provided is necessary and beneficial, thereby significantly improving the quality of services offered to patients. This process not only optimises patient outcomes but also contributes to the more efficient use of healthcare resources.

Patient satisfaction and trust

On the patient side, the reduction of low-value care has a direct and positive impact on patient satisfaction and trust in the healthcare system (Ganguli et al., 2021). When patients receive care that is perceived as necessary and beneficial their satisfaction with healthcare services increases. Patients tend to value treatment that is directly aligned with their health needs and outcomes, rather than care that is superfluous or ineffective. Trust in the healthcare system is bolstered when patients feel that the care they receive is based on their best interests and backed by sound medical evidence. This trust is fundamental to the patient–provider relationship and essential for the effective delivery of healthcare. Effective evaluation and consequent reduction of low-value care not only improves patient outcomes but also reinforces the confidence patients have in their healthcare providers and the system as a whole, leading to a more engaged and cooperative patient population.

Healthcare utilisation

Healthcare utilisation refers to how often and in what ways healthcare services are used by patients, and understanding its dynamics is essential in the evaluation of healthcare interventions. One of the primary goals of these evaluations is to ascertain whether efforts to reduce low-value care, which includes unnecessary or minimally beneficial treatments, results in a tangible decrease in the use of such services (Ganguli et al., 2022). This aspect of evaluation is crucial because it directly affects the efficiency and cost-effectiveness of healthcare delivery when interventions successfully reduce low-value care to the benefit of higher value services. Moreover, evaluations can reveal how the reduction

of low-value care impacts the overall demand for healthcare services, providing insights into patient behaviour and healthcare system efficiency. This understanding is pivotal for strategic planning and resource management within healthcare systems.

Clinical practice

On the frontlines of healthcare, the impact of these evaluations extends into clinical practice. The findings from evaluations guide clinicians to identify which interventions are truly effective in reducing low-value care, thereby informing and shaping clinical guidelines (Ganguli et al., 2022). This information is integral for healthcare providers in order to understand and implement best practices in patient care. By highlighting which practices are low value and which are beneficial, evaluations help in educating clinicians about the most effective and efficient ways to treat patients. This leads to a more evidence-based approach to patient care, ensuring that treatments are not only necessary but also beneficial for patient health. Consequently, informed clinical practice based on evaluation findings not only improves patient outcomes but also enhances the overall quality and sustainability of healthcare services.

Economic sustainability

Evaluating interventions aimed at reducing low-value care plays a crucial role in ensuring the long-term financial sustainability of healthcare systems. This process is vital in identifying and eliminating wasteful expenditures on healthcare services that are not beneficial, or in some cases, even harmful to patients (Ganguli et al., 2022). By focusing resources away from unnecessary care, healthcare systems can more effectively allocate their budgets towards treatments and interventions that offer real value and better health outcomes. This prudent allocation of resources is especially important in the context of rising healthcare costs and the challenges posed by ageing populations, which place additional strains on healthcare budgets. Effective evaluation and management of low-value care, therefore, not only improves patient care but also contributes significantly to the economic health and sustainability of the healthcare system, ensuring that it can continue to meet the needs of its population over time.

Innovation and continuous improvement

The process of evaluating healthcare interventions is a key driver of innovation and continuous improvement within the healthcare sector. By regularly assessing the effectiveness of different healthcare practices, evaluations highlight areas that require improvement, thereby fostering a culture of evidence-based practice among healthcare professionals (Grimshaw et al., 2020). This ongoing process of evaluation and adaptation encourages healthcare systems and providers to continuously refine their practices, seeking more effective, efficient and patient-centred approaches to care. As healthcare needs and technologies evolve, this culture of continuous improvement ensures that healthcare systems remain dynamic and responsive, constantly striving to provide the highest quality

of care. Evaluation not only helps to maintain current standards of care but also acts as a catalyst for future advancements and innovations in healthcare.

Theoretical models and frameworks

To effectively identify and address low-value care, people involved in clinical decision-making, resource allocation and directing services should use theoretical frameworks and targeted evaluation strategies to differentiate necessary from unnecessary care and reallocate resources appropriately (Grimshaw et al., 2020). This section explores the applicability of theoretical frameworks and applied economics approaches to evaluating low-value care.

Theoretical approaches play a crucial role in tackling the challenges of reducing low-value care by offering a comprehensive method for understanding and addressing this issue. These approaches help to identify the key determinants that drive the use of low-value care, such as healthcare provider behaviours, healthcare system structures and existing gaps in knowledge (Grimshaw et al., 2020). With a thorough understanding of these underlying factors, theoretical frameworks and economic evaluation methodologies enable the formulation of precise strategies aimed at overcoming specific obstacles to the reduction of low-value care. Additionally, they enhance the ability to predict the outcomes of interventions designed to minimise low-value care, thereby increasing the likelihood of achieving effective and lasting improvements. Moreover, by providing a structured method for enacting changes in healthcare practices, theoretical models support stakeholders through the complex process of de-implementation and facilitating enduring behavioural adjustments in healthcare delivery.

The evaluation of healthcare interventions, particularly those aimed at reducing low-value care, benefits significantly from structured theoretical frameworks. Each provides a comprehensive approach to assessing interventions but from slightly different perspectives.

RE-AIM framework

The RE-AIM framework is particularly useful in evaluating and planning health interventions to reduce low-value care. The acronym stands for ‘reach, effectiveness, adoption, implementation and maintenance’, which combined determine public health impact:

- **Reach** assesses the extent to which a low-value care reduction initiative can engage the target population (Holtrop et al., 2021), especially those who benefit the most from reducing low-value care practices. It involves assessing the demographics and characteristics of the participants to ensure inclusivity and equity.
- **Effectiveness or efficacy** measures the impact of the intervention on important outcomes, including unintended adverse effects, reductions in low-value care practices and improvements in patient health outcomes. This dimension assesses whether the

intervention achieves its intended goals in real-world settings.

- **Adoption** by target settings or institutions looks the uptake of the intervention among healthcare providers and settings. For low-value care reduction efforts, it evaluates how widely and readily healthcare institutions and practitioners adopt strategies or tools aimed at minimising low-value practices.
- **Implementation** examines the intervention's fidelity and any modifications made during delivery. This includes assessing the consistency, cost and adaptability of reducing low-value care practices across different settings.
- **Maintenance** evaluates the extent to which the intervention becomes part of routine organisational practices and policies, including whether reductions in low-value care practices are sustained over time.

This comprehensive approach helps to identify which aspects of an intervention work well and which need adjustment, facilitating more effective and sustainable low-value care reduction efforts (D'Lima et al., 2022).

Consolidated Framework for Implementation Research

The Consolidated Framework for Implementation Research (CFIR) offers a systematic approach to addressing the multifaceted barriers to reducing low-value care. It encompasses five domains: intervention characteristics, outer setting, inner setting, characteristics of individuals and the implementation process (Safaeinili et al., 2020).

By evaluating these domains, the CFIR framework helps to identify critical factors that influence the successful implementation of low-value care reduction initiatives, allowing for tailored strategies that address specific barriers and facilitators within a given context.

The CFIR offers a comprehensive taxonomy of operationally defined constructs that influence the effectiveness of implementation interventions (Damschroder et al., 2022). It is organised into five major domains:

1. **Intervention characteristics:** considerations include the evidence strength and quality supporting the intervention, and adaptability, cost and complexity. For low-value care reduction, this involves evaluating how the intervention's design and features contribute to its effectiveness.
2. **Outer setting:** encompasses external factors like patient needs and resources, incentives and pressures from external sources. It looks at how external policies and incentives for reducing low-value care affect adoption and sustainability.
3. **Inner setting:** focuses on internal organisational characteristics, including the culture, implementation climate and readiness for implementation. This domain assesses how

healthcare organisations' internal environments support or hinder the reduction of low-value care.

4. **Characteristics of individuals:** involves the individuals involved in the intervention, including their personal attributes, beliefs about the intervention and self-efficacy. This domain evaluates how healthcare providers' attitudes and beliefs towards low-value care and its reduction influence the intervention's success.
5. **Implementation process:** examines the process itself, including planning, engaging, executing, and reflecting and evaluating. For low-value care reduction, this involves assessing how the intervention is implemented, the involvement of key stakeholders, and the use of feedback loops to refine and improve the intervention.

The logic model

The logic model is a tool that visually represents the relationships between resources, activities, outputs and outcomes of a program aimed at reducing low-value care. It helps planners and evaluators understand how an intervention is supposed to work and what it aims to achieve. By outlining the inputs (e.g. financial, human resources) and linking them to short-term and long-term goals, the logic model facilitates a clear understanding of the pathways through which change is expected to occur. It also serves as a critical framework for evaluating the effectiveness of low-value care reduction efforts, enabling stakeholders to measure progress towards objectives and identify areas for improvement (Smith et al., 2020).

The logic model is a powerful tool for evaluating low-value care in healthcare systems, serving multiple functions that enhance the effectiveness and efficiency of healthcare services (Smith et al., 2020). Here's how it can be particularly useful:

1. **Clarifying program objectives:** the logic model helps to clearly define the objectives of interventions aimed at reducing low-value care. By outlining expected outcomes, it ensures that all stakeholders have a shared understanding of the program's goals.
2. **Structuring evaluation:** the model provides a framework for structuring the evaluation of low-value care interventions. By identifying inputs, activities, outputs, outcomes and long-term impacts, the logic model helps to pinpoint where evaluations should be focused to determine effectiveness.
3. **Identifying performance indicators:** through the logic model, specific indicators for performance can be identified at different stages of the intervention. These indicators are crucial for measuring progress towards reducing low-value care, allowing for ongoing monitoring and adjustment of strategies.
4. **Enhancing communication:** the model serves as a communication tool among stakeholders, including healthcare providers, policymakers and funders. By visualising

the process and expected outcomes of interventions, the logic model facilitates better understanding and support across different groups.

5. **Facilitating accountability:** by mapping out the sequence from inputs to outcomes, the logic model holds parties accountable for their roles in implementing interventions. It makes it easier to track whether resources are being used as intended and whether the interventions are producing the desired effect on reducing low-value care.
6. **Supporting continuous improvement:** the feedback loops within a logic model encourage continuous improvement. By regularly reviewing outcomes and impacts against objectives, healthcare organisations can iteratively refine their approaches to minimising low-value care.
7. **Aiding in resource allocation:** the model helps to rationalise the allocation of resources by highlighting the most critical activities and inputs required to achieve the desired outcomes. This can lead to more efficient use of funds and effort, directing them towards areas with the highest impact on reducing low-value care.

Theoretical Domains Framework

The Theoretical Domains Framework (TDF) consists of 14 domains that are designed to cover a wide range of factors influencing healthcare professionals' behaviours (Michie et al., 2005). These domains are derived from psychological and organisational theories to provide a comprehensive understanding of behaviour change.

1. **Knowledge:** awareness or understanding of the guideline or evidence
2. **Skills:** the ability to perform the behaviour
3. **Social/professional role and identity:** beliefs about the nature of one's job, responsibilities and engagement in the professional role
4. **Beliefs about capabilities:** confidence in one's abilities to perform the behaviour (self-efficacy)
5. **Optimism:** belief about the outcomes of the behaviour being positive
6. **Beliefs about consequences:** beliefs about the outcomes of the behaviour, including potential risks and benefits
7. **Motivation and goals:** the process of making a conscious decision to perform a behaviour or a goal that directs behaviour
8. **Memory, attention and decision processes:** the mechanisms for encoding, storing and retrieving information, and how attention and decision-making processes affect behaviour
9. **Environmental context and resources:** the environment and contextual factors that can support or hinder behaviour, including resources, barriers and facilitators

10. **Social influences:** the influence of others on behaviour, including social norms, support and pressure
11. **Emotion:** how feelings, emotions and mood influence behaviour
12. **Behavioural regulation:** strategies and processes to manage or change one's behaviour, including planning, self-monitoring and feedback
13. **Nature of the behaviours:** beliefs about the behaviour itself, including its complexity, the time it takes and its habitual nature
14. **Nature of the knowledge:** specifics about the knowledge required to perform the behaviour, distinguishing between different types of knowledge that may influence behaviour in different ways

Each domain can be targeted with specific interventions to address barriers or leverage facilitators to change healthcare professionals' behaviours, particularly in efforts to reduce low-value care (Michie et al., 2005). By assessing these domains in the context of specific behaviours, interventions can be more effectively designed and implemented to promote evidence-based practices and improve patient care outcomes.

The theory of planned behaviour

The theory of planned behaviour (TPB) is a psychological theory that aims to explain human action in specific contexts, based on the idea that intention toward behaviour, subjective norms and perceived behavioural control influence behaviour (Manstead & Parker, 1995). Its application in evaluating low-value care can provide insights into the reasons behind healthcare professionals' adherence to or departure from recommended practices (Takeshita et al., 2021). TPB explores intention, subjective norms and perceived behavioural control:

1. **Intention:** according to TPB, the most important determinant of behaviour is the intention to perform it. In the context of low-value care, this would involve a healthcare provider's intention to follow or not follow guidelines that identify low-value practices. Understanding the factors that influence these intentions can help in designing interventions to promote the reduction of low-value care.
2. **Subjective norms:** these are the perceived expectations of significant others, such as colleagues, patients and the broader medical community, regarding the behaviour in question. In terms of low-value care, if healthcare professionals perceive that important others believe they should avoid low-value practices, they may be more inclined to do so.
3. **Perceived behavioural control:** is the perceived ease or difficulty of performing the behaviour, influenced by experience and anticipated obstacles. In evaluating low-value care, understanding the perceived barriers and facilitators to avoiding low-value practices can inform targeted strategies to support behaviour change.

TPB can be used to develop surveys or interviews to assess healthcare providers' attitudes, norms and control beliefs about using or avoiding low-value care. Analysing these factors can help identify key leverage points for intervention, such as increasing awareness about the lack of benefit (or harm) of certain practices, altering perceived norms by influencing opinion leaders or through educational campaigns, or enhancing perceived control by providing resources or changing system-level barriers. By understanding the predictors of intention and behaviour as outlined by TPB, healthcare organisations and policymakers can design more effective interventions aimed at reducing low-value care, ultimately improving patient outcomes and resource utilisation.

The COM-B model

The COM-B model (capability, opportunity, motivation and behaviour) is a comprehensive framework for understanding behaviour change (Michie & West, 2013). It suggests that behaviour (B) results from an interaction between an individual's physical and psychological capabilities (C), their physical and social opportunities (O), and their reflective and automatic motivations (M). Capability refers to an individual's psychological and physical capacity to engage in the activity concerned, including having the necessary knowledge and skills. Opportunity encompasses all the factors that lie outside the individual that make the behaviour possible or prompt it, including environmental factors, social context and resources. Motivation covers the brain processes that direct behaviour, including habits, emotional responses, decision processes and analytical thinking.

In the context of evaluating low-value care, the COM-B model can be used to identify why healthcare professionals continue to provide care that is known to be of low value or why they struggle to adopt high-value care practices. For example:

- **Capability:** a provider might lack knowledge about current evidence-based practices or have insufficient skills to implement alternative, higher value interventions.
- **Opportunity:** the healthcare system or organisational context might not support changes in practice due to lack of resources, existing policies or cultural norms that favour the status quo.
- **Motivation:** providers may have personal beliefs or biases that favour certain interventions, regardless of their value, or they may be influenced by patients' expectations or demands for specific treatments.

Understanding these factors can help in designing targeted interventions to change behaviour. For instance, educational programs can enhance capability, changes in healthcare policies or environments can alter opportunities, and addressing beliefs and attitudes can influence motivation (Parker et al., 2022).

By applying the COM-B model to the issue of low-value care, healthcare organisations and policymakers can develop more nuanced and effective strategies for promoting the adoption of

evidence-based, high-value care practices among healthcare professionals, ultimately improving patient outcomes and efficiency within the healthcare system.

Normalisation process theory

Normalisation process theory (NPT) is a conceptual framework developed to understand the factors that support or inhibit the implementation, embedding and integration of new practices or innovations in healthcare settings (Murray et al., 2010). It provides a structured way to evaluate how new practices become normalised, focusing on the work individuals and groups do to make them routine parts of everyday practice. NPT is structured around four core constructs:

- **Coherence (or sense-making):** how people understand the new practice, its purpose and its value. In the context of low-value care, this could involve understanding why certain practices are considered low-value and recognising the need to change or eliminate these practices.
- **Cognitive participation (or engagement):** the relational work people do to build and sustain a community of practice around the new practice. For reducing low-value care, it involves healthcare professionals engaging with each other, policymakers and patients to support the de-adoption of low-value practices.
- **Collective action:** the operational work required to enact the new practice, including the allocation of resources, adjustments to existing workflows and technology use . In evaluating low-value care, it looks at how changes are implemented in clinical settings to reduce low-value practices.
- **Reflexive monitoring:** the appraisal work individuals and groups do to assess and understand how the new practice affects them and others around them. This could involve healthcare providers assessing the impact of reducing low-value care on patient outcomes, costs and their professional practice.

NPT is particularly useful in evaluating low-value care because it provides a comprehensive framework to understand not just the practical aspects of change (like how to reduce low-value care) but also the social processes that underpin these changes. It helps to identify why certain low-value practices persist despite evidence against them and what factors might facilitate their reduction or elimination (Murray et al., 2010). By applying NPT, researchers and healthcare organisations can gain insights into the complexities of changing established clinical practices. It helps in designing interventions that are not only technically sound but also socially feasible, promoting sustainable change towards high-value care. Through NPT, the focus is not only on the ‘what’ of the changes needed but also on the ‘how’ and ‘why’ aspects, ensuring a deeper understanding and more effective strategies for implementing and sustaining these changes.

Application to low-value care reduction efforts

These theoretical frameworks can be applied to the evaluation of low-value care reduction efforts by providing a structured approach to assess interventions comprehensively. They allow researchers and practitioners to consider a broad range of factors that influence the success of these interventions, from the characteristics of the intervention itself to the broader organisational and external environments in which they are implemented. By using these frameworks and theories, evaluators can identify not only whether an intervention was effective but also understand why it was successful or where it fell short, thereby informing future efforts to reduce low-value care in healthcare settings.

De-implementation

De-implementation in the context of low-value care refers to the process of intentionally discontinuing or reducing the use of medical practices, interventions or procedures that are proven to be ineffective, unlikely to provide benefit, or may even cause harm to patients (Verkerk et al., 2018). These are practices that, through rigorous evaluation and evidence, have been identified as not delivering sufficient value for the cost or for the potential risks they pose to patients. However, care deemed to be of low value is not universally so in every context. When addressing low-value care we must consider several elements to formulate successful strategies for its de-implementation (see Table 8.3).

Table 8.3: Elements for consideration of de-implementation

Element	Description
Identifying the underlying causes of low-value care	**Recognising the different types of low-value care, such as ineffective care, inefficient care and unwanted care, can help tailor strategies to address specific issues.**
Customising approaches based on the specific context of the low-value care	**Considering the unique circumstances surrounding each low-value area is crucial for successful de-implementation efforts.**
Integrating patient preferences and values	**Acknowledging that the provision of care not aligned with patient preferences can lead to unwanted interventions and emphasises the critical role of shared decision-making and effective communication in mitigating low-value care.**
Acknowledging the complexities of enacting sustainable change	**De-implementation efforts demand perseverance, substantial time investment and resources to navigate obstacles and achieve lasting positive outcomes in healthcare delivery.**
Accounting for environmental influences	**The impact of local organisational structures, cultural norms, resource availability and financial incentives can influence the success of de-implementation strategies.**

Source: Verkerk et al. (2018)

By incorporating these elements, healthcare professionals, decision-makers and scholars can devise bespoke strategies that effectively minimise low-value care, thereby enhancing the overall quality and efficiency of health services.

The goal of de-implementation is to reduce or eliminate low-value care practices in healthcare. De-implementation aims to address the overuse of unnecessary or ineffective healthcare interventions that do not benefit patients and may even cause harm. By identifying and removing low-value care practices, healthcare systems can improve the quality and safety of care, reduce costs and enhance overall patient outcomes. De-implementation efforts seek to promote evidence-based practices, optimise resource allocation, and ensure that patients receive care that is truly beneficial and aligned with their preferences (Verkerk et al., 2018; Wang et al., 2018).

Active steps for de-implementation

The concept of de-implementation acknowledges that simply identifying low-value care is not enough; active steps must be taken to eliminate or reduce such practices:

- **Identification of leaders in de-implementation:** understand the characteristics of leaders in de-implementation to help find clinical champions who can drive de-implementation initiatives forward. This involves identifying individuals with specific personal characteristics or those with high outcome expectancy and motivation (van Bodegom-Vos et al., 2017).
- **Evidence-based practice:** ensure that that decision to de-implement care is based on strong evidence indicating its ineffectiveness or potential to harm. Use current research, clinical guidelines and data to support the de-implementation process (Wang et al., 2018).
- **Engagement:** engage healthcare providers, patients and other stakeholders in understanding the need to move away from these practices. This can involve educational campaigns, discussions and presenting evidence illustrating the lack of value or potential harm of the practices in question. Engaging stakeholders from the beginning fosters collaboration and support for change (Wang et al., 2018).
- **Clear communication:** communicate transparently with stakeholders about the reasons for de-implementation, the expected outcomes and the timelines . Clear communication builds trust and understanding among stakeholders (Wang et al., 2018).
- **Strategy development:** develop and implement strategies to facilitate the removal of low-value practices from routine care. Strategies can vary widely, from changing reimbursement policies to discourage certain practices to incorporating decision support tools into electronic health record systems or revising clinical guidelines to exclude low-value care (van Bodegom-Vos et al., 2017).

- **Monitoring and evaluation:** continuously monitor the process of de-implementation to assess its impact on healthcare delivery and patient outcomes. This includes evaluating whether discontinuing low-value practices leads to the adoption of higher value alternatives and ensuring that de-implementation does not inadvertently lead to the neglect of necessary care. Factors for measuring process outcome include feasibility, fidelity, cost, penetration and sustainability of the de-implementation efforts (Prusaczyk et al., 2020).
- **Feedback and adaptation:** provide feedback to healthcare providers and systems on the progress of de-implementation efforts and make necessary adjustments to strategies based on observed outcomes and feedback (Wang et al., 2018).

De-implementation challenges include overcoming inertia in clinical practice, addressing financial and professional incentives that may support low-value care, and navigating patient expectations and demands. Effective de-implementation requires a multifaceted approach, combining evidence-based policy, education and system-level changes to shift healthcare practices towards more valuable, patient-centred care.

8.3 Case studies

Case 1: Choosing Wisely Australia

Choosing Wisely Australia, initiated by NPS MedicineWise in 2015 and backed by health professional bodies, fosters national discussion on avoiding unnecessary medical tests, treatments and procedures. It promotes healthcare that is evidence-based, non-redundant, safe and necessary, challenging the belief that more care is always better (O'Callaghan et al., 2015). The campaign encourages the use of theoretical models and frameworks to evaluate and address low-value care. For example, TDF is noted for its relevance in interventions that target professional practice and organisational behaviour change.

Choosing Wisely promotes improved dialogue between clinicians and consumers regarding necessary care, driven by six core principles focused on evidence-based, transparent and -improved practices. Recommendations developed by healthcare professionals provide a foundation for reducing unnecessary healthcare practices.

The campaign's success highlights the power of provider and patient education in reducing low-value care. A key factor was the use of clear, evidence-based recommendations developed by professional societies, making it easier for providers to discuss and justify care decisions with patients. However, impact varied across different practices and regions, indicating the need for local implementation strategies and the importance of measuring and reporting outcomes.

Case 2: Royal Children's Hospital

The Royal Children's Hospital Melbourne is involved in reducing its conception of low-value care, focusing on unnecessary practices that provide little benefit, may cause harm or are costly. The Health Services Research Unit supports initiatives like the EVOLVE project by the Royal Australasian College of Physicians, which identifies low-value treatments in child health. It focuses on creating lists of treatments that should not be routinely performed, based on evidence and expert consensus, and uses a variety of behaviour change models and frameworks to create sustainable change and reduce low-value care. The goal is to improve patient care by eliminating unnecessary and potentially harmful interventions, promoting more sustainable healthcare practices. This is part of broader efforts to ensure healthcare is sustainable by focusing on effective, necessary treatments.

8.4 Unsuccessful case studies

Reducing antibiotic prescriptions for acute respiratory infections

Despite guidelines recommending against the use of antibiotics for most acute respiratory infections), overprescription remains a problem in many settings. This is largely due to interventions being solely focused on provider education without addressing patient expectations or system-level incentives (Barlam et al., 2016). This highlights the need for multifaceted approaches that include patient education, provider feedback mechanisms and potentially system-level changes to reduce the perceived need for prescribing.

Routine daily lab testing in hospitalised patients

Routine daily laboratory tests for hospitalised patients without specific indications represent a common low-value practice. Efforts to reduce this practice often face challenges related to ingrained routines and the perceived safety net of frequent testing (Eaton et al., 2017). Unsuccessful interventions have pointed to the need for strong leadership support, cultural change within institutions and mechanisms that make it easier to follow new protocols, such as changes to order sets in electronic health record systems.

8.5 Implications for practice

Evaluating low-value care programs and interventions has taught us the importance of robust evidence-based practice, effective communication and adaptive healthcare policy. Successes demonstrate the potential for improving patient care and reducing unnecessary costs when interventions are critically assessed and updated. Failures often highlight systemic barriers such as resistance to change, the complexity of disentangling financial incentives, and the challenge of aligning healthcare provider and patient expectations with best practices. These lessons underscore the need for ongoing education, transparent policymaking and a culture that embraces evidence over habit or convenience (Roski et al., 2014). Examples of success strategies, and some of their complexities, include:

- **Provider and patient education:** effective in increasing awareness but must be coupled with actionable tools and system-level support for sustained change
- **System-level incentives and supports:** critical for enabling and sustaining practice change; misaligned incentives can undermine interventions
- **Tailored interventions:** strategies need to be adapted to specific contexts, healthcare settings and target populations for maximum effectiveness
- **Measurement and feedback:** ongoing measurement of intervention impact and regular feedback to providers are key components of successful programs
- **Cultural and behavioural change:** addressing underlying cultural norms and behaviours within healthcare settings is essential for reducing low-value care
- **Maintaining a patient-centred approach:** reducing low-value care emphasises the role of the patient as an active participant in their care, promoting informed choice and shared decision-making

These examples underscore the complexity of reducing low-value care and the need for comprehensive, contextually adapted strategies that address the multifaceted drivers of healthcare provider behaviour and healthcare system dynamics.

Policy implications

The evaluation of interventions aimed at reducing low-value care yields significant insights with broad policy implications. These findings can inform strategies for healthcare policymakers, providers and institutions, guiding the development of effective, scalable interventions that enhance

care quality and efficiency (Colla et al., 2015; Schwartz et al., 2014). Below is an analysis of these policy implications and recommendations for various stakeholders.

- **Cost savings and resource allocation:** evaluations often reveal that reducing low-value care can lead to substantial cost savings and more efficient use of healthcare resources (Pandaya, 2018). Policymakers must consider reallocating these savings to areas of greater need, improving overall healthcare system sustainability.
- **Quality of care:** findings typically indicate that eliminating low-value interventions does not harm patient outcomes and may even improve them by reducing exposure to unnecessary risks. This underscores the need for policies that prioritise patient safety and quality of care over the volume of services provided.
- **Health equity:** evaluations may highlight disparities in the impact of low-value care reduction interventions across different populations. Policies should address these disparities to ensure that efforts to reduce low-value care improve health equity rather than exacerbate existing inequities.
- **Provider behaviour and incentives:** insights into how healthcare providers respond to interventions suggest that traditional fee-for-service models may incentivise low-value care. Policymakers should consider alternative payment models that align provider incentives with the delivery of high-value, patient-centred care.

Policy recommendations

- **Support evidence-based policymaking:** encourage the use of data from evaluations in policy development. Invest in ongoing research to identify and understand low-value practices and effective interventions for reducing them (Chalmers et al., 2018).
- **Implement alternative payment models:** transition from fee-for-service to value-based payment models that reward providers for quality, not quantity, of care. Models could include bundled payments, accountable care organisations or pay-for-performance schemes.
- **Promote transparency and patient engagement:** develop policies that enhance transparency about the benefits, risks and costs of treatments. Support initiatives that empower patients to make informed decisions about their care.
- **Address health disparities:** ensure that policies aimed at reducing low-value care do not inadvertently limit access to necessary services for underprivileged populations. Monitor and evaluate the impact of these policies on different demographic groups (Kim et al., 2021).

For healthcare **providers** (Chalmers et al., 2018):

- **Foster a culture of high-value care:** emphasise the importance of reducing low-value care in training and continuing education. Encourage clinical decision-making that considers the latest evidence, patient preferences and the potential value of interventions.
- **Use decision support tools:** implement clinical decision support systems in electronic health records that alert providers to potential low-value care and suggest alternatives based on best practices and evidence.
- **Engage in shared decision-making:** adopt shared decision-making approaches that involve patients in care decisions, using decision aids where appropriate to facilitate understanding of options.

For healthcare **institutions** (Chalmers et al., 2018):

- **Incorporate low-value care reduction into quality improvement:** make the reduction of low-value care a key component of quality improvement initiatives. Use data analytics to identify areas for improvement and track the impact of interventions.
- **Support provider education and training:** provide resources and opportunities for healthcare providers to learn about identifying and reducing low-value care, including workshops, seminars and access to current research.
- **Create incentive structures:** develop incentive structures that reward providers for reducing low-value care and improving patient outcomes, aligning institutional goals with the delivery of high-value care.

By implementing these recommendations, policymakers, healthcare providers and institutions can effectively address the challenges identified in evaluations of low-value care reduction interventions, enhancing healthcare quality, efficiency and equity.

8.6 Conclusion

This chapter highlighted the criticality of evaluating interventions targeting the reduction of low-value care to enhance healthcare quality, patient safety and system sustainability. Key takeaways include the necessity of robust evaluation frameworks, the role of economic analyses in understanding cost implications, and the importance of addressing systemic and behavioural aspects to effect change. This prompts further reflection on how healthcare systems can more effectively integrate and prioritise evaluations to foster a culture of high-value, patient-centred care.

ACTIVITY

1. Reflect on how the evaluation of low-value care interventions can impact patient outcomes and healthcare efficiency.
2. Find one study on evaluating low-value care interventions and summarise its key findings in a few sentences.
3. A hospital implements a new protocol to reduce unnecessary tests. What evaluation method would you choose to assess its impact?

8.7 References

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Chapter 9: Evaluating the economics of health programs and interventions

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Economic evaluations are pivotal in the optimisation of healthcare resources, particularly in the identification and elimination of low-value care. As healthcare systems globally strive for sustainability amid escalating costs and varying health outcomes, the significance of these evaluations cannot be overstated. They provide a systematic approach to assess the value of healthcare interventions, comparing the costs and outcomes of different healthcare strategies. This process is vital for policymakers, healthcare providers and stakeholders to make informed decisions that enhance the quality of care while ensuring the efficient use of resources.

Despite the critical role of economic evaluations, their integration into clinical practice and policymaking faces challenges. These include the complexity of healthcare interventions, variations in patient populations and the dynamic nature of healthcare technologies. Moreover, ethical considerations often arise when determining the value of healthcare interventions, necessitating a careful balance between cost-efficiency and patient-centred care.

This chapter delves into the intricacies of economic evaluations within the context of low-value care. By understanding the methodologies, applications and challenges of these evaluations, stakeholders can better navigate the complexities of healthcare decision-making. The ultimate goal is to foster a healthcare environment where resources are used effectively, ensuring that patients receive high-value care that is beneficial and cost-effective.

CHAPTER STRUCTURE

This chapter will cover the following topics:

- Economic evaluation fundamentals
    - Cost-minimisation analysis
    - Cost-effectiveness analysis
    - Cost–benefit analysis
    - Cost-utility analysis
    - Social return on investment
- Economic evaluation methodology
    - Perspective analysis
    - Choosing the perspective
    - Uncertainty and sensitivity analysis
- Implications for practice
    - Challenges with identifying low-value interventions
    - Quantifying the impact of low-value care
    - Strategies for reducing low-value care
    - Challenges and limitations
    - Future directions

9.1 Economic evaluation fundamentals

Economic evaluation in value-based healthcare is essential because it provides a framework for comparing the cost-effectiveness of various health programs and interventions, ensuring that resources are allocated to those that offer the greatest value for patient outcomes (Yang et al., 2019). Evaluation helps to identify which treatments yield the most significant health benefits relative to their costs, supporting the prioritisation of interventions that improve quality of care while managing expenses (Goodrich et al., 2012; Turner et al., 2021). Through evaluation, healthcare systems can make informed decisions that balance patient needs with financial sustainability, promoting efficient spending without compromising the quality of care. Additionally, evaluation facilitates transparency and accountability in healthcare spending by demonstrating the return on investment in terms of health gains for the population served. Finally, economic evaluation is key for policymakers and stakeholders to justify funding decisions and to ensure that healthcare spending aligns with the broader goal of maximising patient health and wellbeing within available budgets (Turner et al., 2021).

Cost-minimisation analysis (CMA)

Cost-minimisation analysis (CMA) is an economic evaluation method used in healthcare and pharmacoeconomics to compare the costs of various interventions when it is assumed or has been demonstrated that their effectiveness is equal. CMA aims to find the most cost-effective option among alternatives that deliver identical health outcomes. This approach is only suitable when the effectiveness of the interventions being compared has definitively been shown to be the same, thus making cost the sole factor for consideration.

To verify that health outcomes are the same typically requires an examination of existing research, data from clinical trials or new studies to ensure there is no meaningful difference in effectiveness among the options. CMA is especially valuable in contexts where financial limitations are critical and there is a necessity to choose the option that is most financially feasible without sacrificing the quality or effectiveness of care.

AN EXAMPLE OF CMA

Mariño and colleagues evaluated a community-based oral health promotion program against traditional chairside oral hygiene instructions for improving the gingival health of immigrant older adults in Melbourne, Australia (Mariño et al., 2014). The program, called Oral Health Information Seminars/Sheets (ORHIS), comprised group seminars and individual brushing sessions led by a non-oral health professional educator. Health outcomes were measured as a reduction in gingival bleeding. Clinical outcomes showed a significant 75 per cent reduction in mean gingival bleeding scores among participants, indicating effectiveness equivalent to that of one-on-one chairside instructions. Conventional one-to-one chairside oral hygiene instruction was provided by dental hygienists working in a public dental clinic in Melbourne.

The analysis compared the costs of the ORHIS program and the standard chairside instruction model. ORHIS, serving 100 older adults, was found to be considerably less expensive, costing $6,965.20, in contrast to $40,185.00 for the chairside model. The cost per participant for the ORHIS program was $69.65, significantly lower than $401.85 for the traditional approach.

The findings underscore the cost-effectiveness of community-based oral health interventions. ORHIS not only proved to be an efficient use of financial resources but also highlighted the potential for significant savings without compromising the quality or effectiveness of care. The study advocates for further investment in such community-based programs, emphasising their role in improving public oral health, particularly among older adult immigrant populations.

Cost-effectiveness analysis (CEA)

Australian state and federal authorities employ cost-effectiveness analysis (CEA) to determine the most strategic use of limited healthcare resources. This method weighs the costs against the health improvements provided by various healthcare actions, thereby guiding policy formulation (Hutubessy et al., 2003).

In its application, CEA conducts an organised assessment of various healthcare strategies by juxtaposing their economic implications against health or social benefits such as mortality or hospital admission rates. This method evaluates and contrasts the expenditure for each health outcome unit that is not directly monetary. Depending on the scenario, this could involve improvements in medical conditions, a decrease in gambling instances, or other specific health targets.

The advantages of CEA include offering crucial insights to policymakers for the effective distribution of funds, favouring those options that provide the most benefit within budgetary constraints. Nevertheless, CEA's effectiveness can be hindered by its dependency on theoretical assumptions, the complex nature of outcome measurement and comparison, and the uncertainties involved in forecasting outcomes over the long term.

AN EXAMPLE OF CEA

In Australia, before a new pharmaceutical product is listed on the pharmaceutical benefits scheme (PBS), which subsidises medicines to make them more affordable for the public, it must undergo a rigorous CEA. For instance, a CEA was conducted to evaluate the inclusion of a new antiviral drug regimen for the treatment of hepatitis C (Scott et al., 2022). This analysis compared the new drug's cost with the health outcomes it delivered, such as the number of hepatitis C transmissions prevented, the number of liver diseases averted and improvements in the quality of life of patients. The CEA demonstrated that, despite the high upfront cost of the drug regimen, it was cost-effective overall due to the significant health benefits and the reduction in the need for more expensive treatments for advanced liver disease. This CEA was pivotal in the decision to subsidise the antiviral regimen under the PBS, making it accessible to a broader segment of the Australian population and significantly impacting public health outcomes.

Cost–benefit analysis (CBA)

Cost–benefit analysis (CBA) methodically assesses the overall impact of a proposal on the community and the economy, taking into account broad and specific effects beyond just the immediate or direct financial impacts. CBA aims to assign financial values to all advantages and disadvantages of a proposal, offering a detailed assessment of its overall effect. This approach establishes an unbiased basis for evaluating various outcomes across different timescales by converting all effects into their present monetary worth. CBA serves as a clear guide for decision-making, even when not all outcomes can be precisely quantified in financial terms (Bonner, 2022).

Widely adopted by state and national authorities in Australia, as well as globally, CBA is a principal method for analysing policy or budgetary alternatives. It consolidates the financial impacts of a policy or initiative into a unified analysis. However, one limitation of CBA is the necessity to translate all outcomes into financial figures, which might be dependent on debatable assumptions. It is essential to transparently articulate these assumptions and conduct sensitivity analyses to address potential challenges. Occasionally, it may be challenging to assign monetary values to certain outcomes.

The benefit–cost ratio (BCR) is an important financial measure used to evaluate the return on investment of a project or intervention. It is easily understood by decision-makers and the general public. Essentially, the ratio compares the total benefits received from a project to the total costs of implementing it. For example, if a project has a BCR of 3.5, it means that for every dollar spent on the project, the community gains $3.50 in benefits. This could include economic advantages, improvements in quality of life or environmental enhancements, depending on the project's goals.

AN EXAMPLE OF CBA

Kuklinski and colleagues (2012) conducted a CBA on the Communities That Care (CTC) prevention program. This public health approach is aimed at reducing risks, enhancing protection and diminishing the prevalence of adolescent health and behavioural problems on a community-wide scale. The analysis was grounded on a longitudinal study from grade 5 through grade 8 involving 24 communities across seven states. Prior results had demonstrated that CTC successfully reduced the initiation rates of cigarette smoking, alcohol use and delinquency by the end of eighth grade in the communities where it was implemented, compared to control communities.

The CBA study focused on the monetary benefits associated with the significant effects on cigarette smoking and delinquency prevention versus the cost of implementing the intervention. It presented a conservative estimate, which placed the net present benefit (the current value of all future benefits) at $5,250 per youth. This includes $812 from preventing cigarette smoking and $4,438 from preventing delinquency. The BCR was positive, indicating a return of $5.30 per every dollar invested. Under less conservative and still plausible cost assumptions, the BCR could increase to $10.23 per dollar invested.

The study found that the program was cost-beneficial even when only accounting for the prevention of cigarette smoking and delinquency. The inclusion of alcohol use prevention and quality-of-life gains would have further increased the program's BCR. Overall, the analysis concluded that CTC is a good investment of public funds, offering substantial economic benefits alongside its health and social advantages.

Cost-utility analysis (CUA)

Cost-utility analysis (CUA) assesses the value for money of various health interventions by examining their expenses and their effects on health. This method is commonly applied in healthcare to guide resource distribution decisions (Robinson, 1993). The key metric used in CUA is the quality-adjusted life year (QALY), which encapsulates the extension and enhancement of life resulting from healthcare interventions.

In CUA, the expenditure of each health intervention is evaluated, and outcomes are normalised using QALYs, setting it apart from CEA. The calculation of QALYs involves adjusting the duration spent in any given health condition by a utility factor that signifies the life quality in that condition, based on an individual's health state preferences. This approach enables the comparison of cost-effectiveness across various health interventions by analysing the cost per QALY gained (Bailey et al., 2021).

QALYs are premised on the idea that healthcare interventions lead to two primary benefits: prolonged life and enhanced quality of health-related life (HRQoL), allowing for efficient resource allocation across different areas of healthcare.

The strength of CUA lies in its provision of a uniform health outcome metric, making it easier to compare the effectiveness of different health interventions. This aids policymakers in allocating resources towards interventions that deliver the highest health benefits per unit of cost, measured in QALYs. However, this approach faces obstacles in the precise measurement of HRQoL and must navigate ethical considerations and the challenge of incorporating non-health benefits into its analysis.

AN EXAMPLE OF CUA

James and colleagues investigated the cost-utility of three bariatric surgery procedures – adjustable gastric banding (AGB), Roux-En-Y gastric bypass (RYGB) and sleeve gastrectomy (SG) – against usual care, which comprises conventional pharmacotherapy, diet and exercise, within the Australian public healthcare system (James et al., 2017). All bariatric surgeries were found to be cost-effective. Incremental cost-effectiveness ratios (ICERs) were $24,454 for AGB, $22,645 for RYGB and $27,523 for SG compared to usual care. These values fall below the willingness-to-pay threshold of $70,000 per quality-adjusted life year (QALY), suggesting that from a cost-effectiveness perspective, all three surgeries are viable options.

The study concluded that bariatric surgery represents a cost-effective treatment strategy for managing obesity in the Australian healthcare context, particularly for patients with diabetes, where it may lead to net savings. The findings support the broader adoption of bariatric surgery within publicly funded healthcare systems in Australia, provided there is effective follow-up care to prevent weight regain.

Social return on investment (SROI)

The social return on investment (SROI) method enables organisations and policymakers to factor non-market social advantages into their evaluations (The SROI Network, 2012). It quantifies the social, environmental and economic benefits produced by an initiative or project. SROI differs from CBA by including broader impacts on society and stakeholders, not just traditional financial results. This method involves pinpointing stakeholders, delineating outcomes and attaching financial figures to these results. It is particularly noted for encompassing social benefits and costs that might be overlooked in standard CBA. Nevertheless, SROI is not the go-to method for economic evaluation by state and federal governments in Australia.

To determine SROI, organisations adhere to principles that engage stakeholders in the evaluation and measurement of outcomes, credit changes to the initiative or project, and monetise these changes through methods like assessing the willingness to pay or accept compensation. The resulting ratio indicates the social value created for each investment unit. The advantages of SROI include showcasing an initiative’s full impact, supporting decisions on resource distribution and enhancing

transparency. Yet challenges exist, such as the subjective assignment of value to social outcomes, the risk of overlapping values and difficulties in measuring long-term or indirect effects.

AN EXAMPLE OF SROI

Hyatt and colleagues conducted a study to evaluate the social value and return on investment of lung cancer supportive care services using the SROI methodology (Hyatt et al., 2022). The study foregrounded the high unmet needs of lung cancer patients and their caregivers, which lead to significant healthcare use and financial burden. It highlighted the efficacy of cancer supportive care in mitigating these issues but noted a global lack of investment due to insufficient economic evidence of benefits.

The SROI model developed in this study was based on qualitative stakeholder consultations and published evidence. It forecast the potential social value and cost savings of a hypothetical model of quality lung cancer supportive care over one-year and five-year periods. The outcomes showed that for every Australian dollar invested in supportive care, a social return of $9 is obtained in one year, increasing to $11 over five years. This indicates significant cost savings for the healthcare system and substantial benefits for patients. This study underscores the cost-effectiveness of supportive care for lung cancer patients in tertiary healthcare settings. It advocates for increased investment in supportive care services, highlighting the potential for significant economic savings and improved patient outcomes over time. The findings serve as strong evidence for policymakers, clinicians and consumers to promote further investment in cancer supportive care.

9.2 Economic evaluation methodology

The methodology of economic evaluations in healthcare is multifaceted, incorporating several key components that ensure the accuracy and relevance of the analysis (Sharma et al., 2021; Turner et al., 2021). Understanding these components is crucial for interpreting the results of an evaluation and for designing studies that accurately assess the value of healthcare interventions.

Perspective of analysis

The perspective of analysis in economic evaluations of healthcare interventions is a fundamental concept that dictates whose costs and benefits are considered within the analysis. It sets the boundary for which types of costs (direct, indirect, intangible) and benefits are included, based on the viewpoint of the analysis. This choice significantly impacts the results and conclusions drawn from the economic evaluation. The perspective should align with the objectives of the evaluation and the decision-makers' needs. Below are detailed explanations of the main perspectives commonly adopted in economic evaluations.

Societal perspective

The societal perspective is the broadest viewpoint, encompassing all possible costs and benefits of a healthcare intervention, regardless of who incurs them (Turner et al., 2021). This perspective includes:

- **Direct medical costs:** costs related to the provision of healthcare services, including hospital stays, physician visits, medication and any other healthcare services
- **Direct non-medical costs:** costs that fall outside healthcare service provision but are directly related to the intervention, such as transportation to healthcare facilities, home modifications, caregiver expenses and costs related to social services (e.g. child protection, family services, justice system)
- **Indirect costs:** costs related to lost productivity due to illness, disability or premature death; these costs reflect the economic impact of health conditions on work and productivity
- **Intangible costs:** although not always quantified due to their subjective nature, intangible costs include pain, suffering and decreased quality of life

Many health economists recommend the societal perspective because it provides a comprehensive analysis of the total impact of an intervention, facilitating policy decisions aimed at societal welfare.

Healthcare system perspective

This perspective focuses on the costs and benefits directly related to the healthcare system. It is narrower than the societal perspective and includes:

- **Direct medical costs:** similar to the societal perspective but restricted to costs borne by the healthcare system, such as treatment, medication and hospitalisation

This perspective is particularly relevant for healthcare providers, insurance companies and government healthcare bodies, as it aligns with their financial responsibilities and interests (Turner et al., 2021).

Patient perspective

The patient perspective concentrates on the costs and benefits that directly affect the patient, including:

- **Out-of-pocket expenses:** costs paid directly by the patient, such as co-payments for medications and services, and non-reimbursed medical expenses
- **Health outcomes:** the direct health benefits experienced by the patient, including improvements in symptoms, quality of life and disease prognosis

This perspective is crucial for understanding the financial impact of healthcare interventions on patients and can inform policies aimed at reducing the economic burden on individuals (Turner et al., 2021).

Payer perspective

In some analyses, especially in countries with multiple healthcare payers (e.g. private insurance companies, government programs), the payer perspective may be adopted. This perspective focuses on the costs and benefits accruing to the payer, which could include direct medical costs and any indirect costs they are responsible for covering (Sharma et al., 2021).

Choosing the perspective

The choice of perspective has significant implications for the outcomes and recommendations of an evaluation. A broader perspective, like the societal view, may capture benefits that are overlooked by narrower perspectives, but it also requires more comprehensive data collection and analysis. The selection should be driven by the study's goals, the intended audience of the results and the context within which decisions will be made.

In practice, the choice of perspective can profoundly influence policy recommendations, resource

allocation and ultimately patient care and health outcomes. For instance, an intervention that appears cost-effective from a healthcare system perspective might not be deemed so from a societal perspective if significant indirect costs or societal benefits are ignored (Turner et al., 2021). This discrepancy can lead to divergent policy recommendations and resource allocation decisions, impacting patient care and health outcomes.

It is therefore paramount for evaluators to not only carefully choose their analysis perspective based on the evaluation aims and the decision-making context but also to transparently report this choice (Sharma et al., 2021; Špacírová et al., 2020). Understanding the perspective implications allows stakeholders to interpret the results within the appropriate context, ensuring that decisions based on the evaluation are aligned with broader health policy goals and societal values. This careful consideration and transparency in reporting are essential for the credibility and utility of economic evaluations in healthcare decision-making, guiding interventions that are not only cost-effective but also aligned with societal priorities and ethical standards.

Uncertainty and sensitivity analysis

Uncertainty analysis aims to quantify the uncertainty in the outcomes of a model or analysis due to the uncertainty in its input parameters. This type of analysis is important because it provides a range of possible outcomes rather than a single deterministic outcome. It acknowledges that the exact values of all inputs into a cost–benefit or cost-effectiveness model may not be known with certainty, due to limitations in data quality, variability in the data or inherent unpredictability of future events. For example, in a healthcare cost-effectiveness analysis of a new treatment, the exact future costs of producing the treatment or its exact effectiveness in the population might not be known. Uncertainty analysis might involve running the analysis multiple times using a range of values for these uncertain parameters to see how the outcomes vary.

Sensitivity analysis, on the other hand, systematically varies the inputs to a model to understand how changes in those inputs affect the outcomes of the model. This helps identify which inputs are most influential on the model's outcomes, indicating where efforts to improve the accuracy of the analysis should be focused. For instance, if a sensitivity analysis of a health intervention's cost–benefit analysis shows that the model's outcomes are highly sensitive to the choice of discount rate (the rate used to put a present value on costs and benefits that will occur later), then ensuring the accuracy of the discount rate (e.g. using the real inflation rate over time) used in the analysis becomes crucial.

9.3 Implications for practice

Economic evaluations are essential tools in the healthcare decision-making process, particularly in identifying low-value interventions – those that offer minimal benefits at disproportionate costs. Through methodologies such as cost-effectiveness analysis and cost-utility analysis, these evaluations compare the costs and outcomes of different healthcare interventions. An intervention is deemed low value if it incurs higher costs without corresponding improvements in health outcomes compared to alternatives. By highlighting interventions with minimal health benefits relative to their costs, economic evaluations guide healthcare systems in allocating resources more efficiently (Turner et al., 2021). They support the prioritisation of high-value care by identifying areas where spending can be reduced without compromising patient outcomes, thus enhancing the overall value delivered by healthcare services. This process aids not only optimising healthcare spending but also improving patient care by focusing resources on interventions that provide meaningful health improvements.

Identifying low-value healthcare interventions through economic evaluations is crucial for optimising resource allocation and improving patient care. Table 9.1 describes two case studies illustrating how economic evaluations have been instrumental in pinpointing such low-value interventions.

Table 9.1: Two economic evaluation case studies

Case study	Economic evaluation	Findings	Outcome
Prostate-specific antigen (PSA) screening has been widely used to detect prostate cancer at early stages (Heijnsdijk et al., 2020; Paschen et al., 2022)	**A comprehensive economic evaluation using CEA was conducted to assess the value of routine PSA screening versus no screening. The analysis considered direct medical costs (including the cost of the screening, follow-up diagnostics and treatments) and outcomes measured in QALYs.**	**The study found that routine PSA screening led to a marginal increase in life years gained but at a significantly high cost, with an ICER exceeding widely accepted thresholds for cost-effectiveness. Additionally, the screening led to a high rate of overdiagnosis and overtreatment, with associated harms and costs.**	**Based on the economic evaluation, PSA screening for prostate cancer was identified as a low-value intervention for the general population. The findings led to recommendations against routine PSA screening, suggesting that resources could be better allocated to high-value care areas.**
Preoperative testing (such as blood tests, electrocardiograms and chest X-rays) before low-risk surgeries is a common practice intended to identify issues that might complicate surgery or anaesthesia (Berlin et al., 2021; Ferrando et al., 2005; Flamm et al., 2011)	**A CEA estimated the costs associated with routine preoperative testing compared to selective or no testing for patients undergoing low-risk surgeries. The analysis looked at direct medical costs, including the cost of the tests and any follow-up care, and measured outcomes in terms of adverse surgical events avoided.**	**The evaluation demonstrated that routine preoperative testing for low-risk surgeries did not significantly reduce adverse surgical outcomes but led to increased healthcare costs due to unnecessary testing and follow-up interventions. The ICER for routine testing compared to selective or no testing was found to be substantially high, indicating low value.**	**The economic evaluation revealed that routine preoperative testing before low-risk surgeries is a low-value intervention. This has led to changes in clinical guidelines, advocating for a more selective approach to preoperative testing, thereby reducing unnecessary healthcare spending and focusing on interventions that genuinely improve patient outcomes.**

Challenges for economic evaluation

These case studies underscore the importance of economic evaluations in healthcare decision-making, guiding the shift away from low-value interventions towards more effective and efficient use of healthcare resources. However, they also highlight several challenges associated with identifying and addressing low-value interventions through economic evaluations:

- **Data availability and quality:** high-quality, comprehensive data are required to accurately assess the costs and outcomes associated with healthcare interventions. In both

case studies, the availability of reliable data on long-term outcomes, patient quality of life, and direct and indirect costs was crucial for conducting robust economic evaluations. Data limitations can lead to uncertainty in the evaluation's findings and recommendations.

- **Overdiagnosis and overtreatment:** a significant challenge, particularly evident in the PSA screening case, is the issue of overdiagnosis and the consequent overtreatment. These factors can inflate the perceived benefits of an intervention while understating its costs and harms, complicating the assessment of its value.
- **Changing clinical practices and guidelines:** both case studies illustrate the difficulty in changing established clinical practices and guidelines based on economic evaluation findings. Healthcare professionals and patients may have entrenched beliefs about the value of certain interventions, such as the importance of routine preoperative testing, making it challenging to shift towards evidence-based practices.
- **Balancing cost, quality and access:** economic evaluations aim to balance cost savings with the quality and accessibility of care. However, recommending the reduction or elimination of certain interventions, like routine PSA screening, can raise concerns about access to care and the potential for missing early disease detection, necessitating careful consideration and communication of the trade-offs involved.
- **Stakeholder engagement and policy implementation:** engaging a wide range of stakeholders (including clinicians, patients, policymakers and payers) in the process of identifying and eliminating low-value care is challenging. Achieving consensus on what constitutes low-value care and implementing changes in policy and practice based on economic evaluations requires coordinated efforts and clear communication of the evidence and its implications.
- **Ethical and equity considerations:** both case studies touch on ethical and equity issues, such as the risk of exacerbating health disparities by universally applying findings without considering population-specific factors. Economic evaluations must be sensitive to these concerns to ensure that recommendations do not inadvertently disadvantage certain patient groups.

Addressing these challenges requires a multifaceted approach, including improving data collection and analysis methods, enhancing stakeholder engagement, and fostering a culture of continuous learning and adaptation in healthcare practices based on the best available evidence.

Quantifying impacts

Quantifying the impact of low-value care on healthcare systems is crucial for understanding its economic burden and for guiding efforts to enhance efficiency and patient care quality. Low-value

care, which encompasses interventions that offer little to no benefit to patients, can significantly drain healthcare resources, diverting funds away from more effective and necessary treatments (Cliff et al., 2021). The economic burden of such care includes not only the direct costs associated with the provision of unnecessary services – such as diagnostics, treatments and hospital stays – but also indirect costs like lost productivity due to unnecessary treatment or recovery time. Moreover, the allocation of resources to low-value care can lead to increased healthcare costs overall, contributing to financial strain on healthcare systems and potentially increasing out-of-pocket expenses for patients (Grimshaw et al., 2020).

The impact of low-value care extends beyond financial considerations, affecting resource allocation and healthcare quality. Allocating resources to low-value interventions limits the availability of those resources for high-value care that could significantly improve patient outcomes. For example, funds spent on widespread screening or tests that have been shown to offer minimal benefit could be redirected towards preventive care measures, research or treatments that have a substantial, evidence-based impact on health (Cliff et al., 2021). This misallocation can also lead to longer wait times for essential services, reducing the overall quality of care and patient satisfaction. Furthermore, the practice of delivering low-value care can erode trust in the healthcare system, as patients may question the necessity and effectiveness of the treatments they receive (Cliff et al., 2021). By identifying and reducing low-value care, healthcare systems can reallocate resources more effectively, improving access to high-quality, high-value healthcare services and enhancing patient outcomes. Reducing low-value care has the potential to decrease healthcare costs and to foster a more patient-centred approach to care, where interventions are tailored to deliver genuine value and benefit to patients.

Reduction strategies

Strategies for reducing low-value care through economic evaluations focus on leveraging the insights these analyses provide to inform policy decisions and clinical practice. Economic evaluations shed light on the cost-effectiveness of healthcare interventions, identifying those that do not provide sufficient value. Decision-makers, including policymakers and healthcare administrators, can use this information to develop policies that discourage the use of low-value interventions and instead encourage practices that offer better health outcomes per dollar spent. For instance, reimbursement policies can be adjusted to favour high-value care, and incentives can be created for providers who minimise low-value practices. Furthermore, integrating the findings of economic evaluations into clinical guidelines is a vital strategy. By embedding cost-effectiveness data into guidelines, healthcare providers are equipped with evidence-based recommendations that prioritise high-value care. This integration helps ensure that clinical decisions are not only medically sound but also economically prudent, aligning healthcare delivery with the best interests of patients and the sustainability of the healthcare system. Through these strategies, economic evaluations become a cornerstone of efforts to enhance the efficiency and effectiveness of healthcare, guiding the

allocation of resources towards interventions that truly improve patient outcomes and system-wide health quality.

Challenges and limitations

Addressing the challenges and limitations inherent in economic evaluations of healthcare interventions requires careful consideration, particularly when it comes to ethical considerations and the limitations of current methodologies. Ethically, there's a fine balance between cost-efficiency and ensuring equitable access to care for all patients. Economic evaluations might inadvertently prioritise efficiency over equity, potentially marginalising certain patient groups or undervaluing interventions that are critical for less common but severe conditions. Methodologically, current economic evaluations may not fully capture the complexity of healthcare interventions and their impacts on diverse patient populations. These methodologies often rely on averages that may not reflect individual patient needs and outcomes, leading to a one-size-fits-all approach in healthcare decision-making.

Most economic evaluations are constrained by the quality and availability of data and the means to estimate outcomes or effect size, particularly long-term health outcomes and real-world effectiveness of interventions. There's also a need for improvement in how these evaluations incorporate patient-reported outcomes and quality of life measures, ensuring that the value of healthcare interventions is assessed holistically. Addressing these challenges requires ongoing methodological innovation, greater inclusivity in evaluation processes, and a commitment to balancing efficiency with ethical considerations in healthcare policy and practice.

Future directions

The future of economic evaluations in healthcare lies in embracing innovative approaches and harnessing the power of technology and data analytics to refine the identification of low-value care. Advancements in big data, artificial intelligence and machine learning offer unprecedented opportunities to analyse vast datasets, revealing insights into the effectiveness and efficiency of healthcare interventions across diverse populations. These technologies can enable more personalised economic evaluations, taking into account patient-specific factors to determine the true value of interventions on an individual level.

Additionally, the integration of real-world evidence gathered from electronic health records, patient registries and wearable devices will enhance the accuracy and relevance of economic evaluations. This shift towards more dynamic and data-driven analyses promises to uncover nuances in healthcare delivery and outcomes that traditional methodologies might overlook. By leveraging these technological advancements, future economic evaluations can provide a more subtle understanding of value in healthcare, guiding the allocation of resources towards interventions that genuinely improve patient health and wellbeing while minimising waste and inefficiency. This evolution in

economic evaluations will play a critical role in shaping more effective, efficient and patient-centred healthcare systems.

9.4 Conclusion

In summarising the critical examination of economic evaluations in healthcare, it is clear that these analyses are essential to identifying low-value care, guiding the efficient allocation of resources and enhancing patient outcomes. Through a variety of methodologies, including cost–benefit, cost-effectiveness, cost-utility and cost-minimisation analyses, economic evaluations provide a structured approach to comparing the costs and outcomes of healthcare interventions. Despite some ethical considerations and methodological limitations, these evaluations offer invaluable insights that help in steering healthcare practices towards more beneficial and cost-effective care.

Looking ahead, the integration of technology and data analytics into economic evaluations holds promise for refining the identification and elimination of low-value care, ensuring resources are directed towards interventions that truly improve patient health. As healthcare systems grapple with rising costs and increasing demand, the role of evaluation in promoting a value-conscious culture in healthcare becomes ever more critical. Continuously focusing on these evaluations will not only aid in optimising healthcare delivery but also help to secure the sustainability of healthcare systems, making the pursuit of high-value care an attainable goal for the benefit of patients, communities and healthcare systems.

ACTIVITY

This activity defines BCR and ICER and provides a scenario for the economic evaluation of two cancer treatment methods.

- **Benefit-cost ratio:** a ratio that compares the benefits of an intervention to its costs. A BCR greater than 1 indicates that the benefits outweigh the costs.
  BCR = Total Benefits / Total Costs
- **Incremental cost-effectiveness ratio:** a metric used to compare the relative costs and outcomes (effects) of two or more interventions. It is calculated as the difference in costs between two interventions divided by the difference in their effects.
  ICER = (Cost B – Cost A) / (Effect B – Effect A)

Scenario

Two clinical treatments (A and B) are implemented to treat a cancer disease. Outcomes are measured as change in health-related quality of life – measured as QALY; the quality of life usually represented on a scale from 0 (death) to 1 (perfect health) – in the three years after

the treatments. Treatment A provides a health benefit for three years with the annual increase in QALY at 0.6 and Treatment B for four three years, with the annual QALY gain of 0.7 for both interventions at 0.8. Assume that one QALY equals $60,000, which is the Australian GDP per capita.

Treatment	Cost ($)	Benefit (QALY gain)($)	Benefit (QALY gain)($)	Benefit (QALY gain)($)	Total Eeffects (QALYs)
		Year 1	Year 2	Year 3	
A	50,000	0.650,000	50,0000.6	50,0000.6	1.82.4
B	70,000	40,0000.7	0.740,000	40,0000.7	2.13.2

1. Calculate the BCR for each treatment intervention.
2. Calculate the ICER for each treatment intervention.
3. Discuss the implications of the BCR values.
4. Discuss the implications of the ICER value.
5. Outline the practical implications of BCR and ICER in health policy and decision-making.
6. Discuss scenarios where an intervention with a lower BCR might be chosen based on other factors such as equity or ethical considerations.

Worked Answer

1. **Compute the BCR for each treatment intervention.**

- **Treatment A:**
    - **Total benefits:** Sum of benefits over 3 years = 1.8 * $60,000 = $108,000
    - **Total costs:** Sum of costs = $50,000
    - **BCR for A:** Total benefits / Total costs = $108,000 / $50,000 = 2.16
- **Treatment B:**
    - **Total benefits:** Sum of benefits over 3 years = 2.1 * $60,000 = $126,000
    - **Total costs:** Sum of costs = $70,000
    - **BCR for B:** Total benefits / Total costs = $126,000 / $70,000 = 1.80

2. **Compute the** ICER for each treatment intervention.

- Cost A = $50,000
- Cost B = $70,000
- Effect A = 1.8 QALYs
- Effect B = 2.1 QALYs

$$\text{ICER} = \frac{\text{Cost B - Cost A}}{\text{Effect B - Effect A}} = \frac{70,000 - 50,000}{2.1 - 1.8} = \$66,667\text{QALY}$$

3. **Discuss the implications of the BCR values.**

- **Treatment A:** BCR of 2.16 indicates that for every dollar spent, the benefit is $2.16, suggesting it is a highly cost-effective intervention.
- **Treatment B:** BCR of 1.80 indicates that for every dollar spent, the benefit is $1.80, which also suggests cost-effectiveness, but to a lesser extent compared to Treatment A. Although the new integrated Treatment B could generate a greater effect (2.16 QALYs vs 1.80 QALYs) on cancer patients via the treatment, it is less cost-effective than the standard Treatment A.

4. **Discuss the implications of the ICER value**

- The ICER of $66,667/QALY for Treatment B compared to Treatment A means that it costs an additional $66,667 to gain one more QALY with Treatment B. Decision-makers often use a threshold (such as $50,000–$60,000 / QALY) to determine if the ICER is acceptable. If the ICER is below the threshold, the more expensive treatment (Treatment B) may be considered cost-effective. In this case, Treatment B is not considered cost-effective compared with Treatment A.

5. **Outline the practical implications of BCR and ICER in health policy and decision-making.**

- **BCR:** helps determine if an intervention's benefits justify its costs. A BCR greater than 1 indicates a favourable return on investment, aiding in prioritising interventions.
- **ICER:** helps to compare the cost-effectiveness of multiple interventions. It is crucial for deciding how to allocate limited resources to maximise health benefits.

6. **Discuss scenarios where an intervention with a lower BCR might be chosen based on other factors such as equity or ethical considerations.**

- **Equity:** if an intervention targets underserved populations or reduces health disparities, it might be preferred even if the BCR is lower
- **Ethical considerations:** interventions that address severe health conditions or provide essential services may be prioritised due to ethical obligations
- **Long-term benefits:** some interventions may have lower short-term BCR but result in significant long-term health improvements and cost savings

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Review Statement

La Trobe eBureau open publications rely on mechanisms to ensure that they are high quality, and meet the needs of all students and educators. This takes the form of both editing and double peer review.

Copyediting

This publication has been reviewed by an IPED accredited editor to improve the clarity, consistency, organisation structure flow, and any grammatical errors.

Peer review

Two rounds of peer review were completed for this publication in August 2024.

The peer review was structured around considerations of the intended audience of the book, and examined the comprehensiveness, accuracy, and relevance of content, as well as longevity and cultural relevance.

Changes suggested by the editor and reviewers were incorporated by the author in consultation with the publisher.

The Publisher would like to thank the reviewers for the time, care, and commitment they contributed to the project. We recognise that peer reviewing is a generous act of service on their part. This book would not be the robust, valuable resource that it is were it not for their feedback and input.