11 Health Economics, Healthcare Funding including Activity-Based Funding: What a Medical Manager Needs to Know

Craig Margetts

Learning Objectives
The reader should gain the following:

- A broad understanding of the economic and political environment in which healthcare functions, as well as a brief international comparison of healthcare expenditure.
- An introduction to the five key funding paradigms for healthcare, including activity-based funding (ABF), and the risks, benefits, and challenges associated with each one.
- A detailed understanding of ABF including a brief history of Casemix, the International Classification of Diseases (ICD-10-AM), Australian Refined Diagnosis Related Groups (AR-DRGs), and National Weighted Activity Units (NWAU).
- An appreciation of the crucial importance of accurate and complete documentation in the monitoring of quality, and maximisation of revenue.

11.1 Introduction

Healthcare is one of the largest sectors for expenditure in any developed economy. In 2019, an average of 8.8% of Gross Domestic Product (GDP) or US$4,097 per person was spent on healthcare across 34 countries according to the Organisation for Economic Cooperation and Development (OECD) [1].

This chapter will explore the role that Health Economics plays in the design and implementation of healthcare methodologies and commences with a discussion on healthcare funding comparisons around the nations of the world.

Next, a model is presented explaining various ways healthcare is funded using two dimensions:

1. The extent to which clients or patients group together as joint *Purchasers*, ranging from an individual patient paying out-of-pocket for themselves, through various levels of private insurance, up to "universal healthcare".
2. The extent to which the resources of health service providers are aggregated or "bundled" into identifiable *Services* to be funded or purchased. This ranges from fixed, or expenditure-based funding, through activity-based funding and up to population-based funding.

Each method involves a defined level of both financial and clinical quality risk that must be unpacked, understood, and managed by the medical manager. An understanding of these funding methods and the ability to manage these risks represents an essential knowledge base and skill set for medical administrators and clinical leaders.

An in-depth review of Activity-Based Funding (ABF) follows, as one of the key and enduring methods of healthcare financing.

C. Margetts (✉)
Cleveland, QLD, Australia

E. Loh, P. W. Long (eds.), *Textbook of Medical Administration and Leadership*,
https://doi.org/10.1007/978-981-99-5211-3_11

11.1.1 Board-Level Reporting

Balance sheets and cash flow statements are important reports for board members, particularly in the private sector where capital funding and cash solvency are key issues to be managed. Clinical directors and medical administrators are rarely required to analyse these two aspects, and the analysis and interpretation of these reports are not covered in this chapter.

Aspiring board members should consider the Australian Institute of Company Directors (AICD) course aimed specifically at this level of corporate governance.

The management of expenditure, the maximisation of revenue, and the interpretation of their associated reports, on the other hand, are core skills and are covered in some depth in this chapter and the subsequent chapter.

11.2 Health Economics

Health economics describes a branch of economics that is concerned with the efficiency, effectiveness, value, and behaviour in the production and consumption of health and healthcare [2]. Kenneth Arrow is acknowledged as the father of health economics following the publication of his paper entitled *"Uncertainty and the Welfare Economics of Medical Care"* in 1963 [3].

A major consideration for Health Economists is the optimal method of funding care. The discipline also focusses on the signals that are being sent by healthcare purchasers to healthcare providers, explicitly or implicitly, by the choices in funding methodology. This can vary significantly over time, and between countries. A brief overview is provided here.

11.2.1 Healthcare as a Luxury Item

In 1977 Joseph Newhouse compared Gross Domestic Product per head of population with expenditure on healthcare and noted a "price elasticity significantly greater than one" between countries.[1] He argued, therefore, that healthcare had the hallmarks of a "luxury" item.

Others subsequently questioned this, pointing out that ***micro***economic approaches, which consider the behaviours of individuals, are not appropriate for ***macro***economic studies between countries, and in any event, a better analysis was based on Purchasing Power Parities (PPPs). When this was done the data tended to suggest that healthcare behaved as a necessity rather than a luxury in terms of its behaviour economically. It was suggested that system design, doctor remuneration, and the ratio of public to private healthcare were more significant factors to explain the variability between countries than price alone [4]. More recent studies have continued to further debunk the "luxury" argument [5].

Despite this, governments, lobbyists, and the public, continue to debate whether or not healthcare should be free to consumers at the point of consumption, with the argument tending to be split along political lines: conservative views favouring a co-payment to avoid over-use, while more liberal views calling for healthcare to be provided at no cost to the consumer.

Others argue a better alternative to rationing based on price and the ability to pay, is by the use of gatekeepers or rationing based on availability and clinical need. The Australian Medicare system, for instance, requires a referral from a General Practitioner (GP) to see a specialist, ensuring that higher-level services are provided only where there is a genuine need for specialist advice. Patients can then be discharged, back to their GP, for ongoing care in a less expensive setting.

[1] "Price elasticity" describes the impact on purchasing behaviour when the cost of the item rises. A price elasticity of one means that price has no effect on purchasing and is typical of the necessities of life which tend to be purchased regardless of price. Items with a price elasticity significantly greater than one (such as luxury goods) tend to be purchased less when the price rises, and more when it is cheaper or free.

11.2.2 Healthcare Expenditure Growth Over Time

Like all countries, Australia and New Zealand have increased their healthcare expenditure over time. Table 11.1 reveals significant growth in cost per person over 50 years.

For example, the 1971 cost of healthcare per person in Australia was US$213, or US$2383 in 2020 dollars, after allowing for Australian inflation. By 2020 this had grown to US$5627.

When measured as a percentage of GDP, this represents growth from 4.5% to 10.6% meaning that both in real terms, and in the percentage of GDP, the cost of healthcare per person has grown 236% over 50 years in Australia, and about 190% in New Zealand, according to the OECD.

A similar calculation for the US, on the other hand, shows a 518% growth [1, 6].

The causes for this growth in cost are varied. One reason is the ageing of the population, and this is clearly one of the major causes, as are the increases in the variety and cost of available diagnostic modalities and treatments, with healthcare inflation significantly outpacing the Consumer Price Index (CPI).

One other, often forgotten reason for this increase is the success of healthcare itself. Interventions now cure many previously fatal conditions, and surviving patients go on to experience other illnesses and will inevitably require many more episodes of care throughout their (now longer) lives. Clearly, this is to be celebrated, but it is also important to remember when looking at healthcare planning and healthcare economics into the future.

11.2.2.1 The Economic Impact of Artificial Intelligence, Robotics and Automation

Healthcare is still largely a cottage industry, notwithstanding the expense. Its relative lack of standardisation and little automation makes healthcare stand out when compared with other industries, which have reaped massive quality and productivity improvements through automation, robotics, and now through artificial intelligence [7, 8].

It is likely that automation will play a central part in health economics of the future, as it holds the promise to radically alter the cost and quality paradigms for health, in the same way as automation has changed many other industries [9].

Calls for health technology to be controlled and regulated so that it can never replace a human doctor, are reminiscent of historical battles against automation of knitting mills and other industries, dating back two hundred years. Those

Table 11.1 Historical health expenditure in Australia and New Zealand

Health Spending: Year	New Zealand per capita in US$	New Zealand as a percent of GDP	Australia per capita in US$	Australia as a percent of GDP
1970[a]	215	5.1%	213	4.5%
1980	500	5.7%	592	5.8%
1990	1,023	6.7%	1,166	6.5%
2000	1,565	7.5%	2,153	7.6%
2010	3,043	9.6%	3,593	8.4%
2018[b]	3,913	9.0%	5,194	10.1%
2019	4,250	9.0%	5,130	10.2%
2020[c]	4,469	9.7%	5,627	10.6%

At current prices and PPPs in US dollars
OECD (2022), Health spending (indicator). doi: 10.1787/8643de7e-en (Accessed on 14 September 2022) https://data.oecd.org/healthres/health-spending.htm
[a]Australia = 1971
[b]Pre-COVID-19
[c]Post COVID-19

who repeat the tactics and approaches of the past are likely to be similarly unsuccessful [10].

A more valuable role for medical leaders is to seek to understand how best to manage and govern the judicious introduction of technology to ensure that healthcare continues to be both readily available and affordable to everyone, without having to choose between the two.

An unpublished document entitled "Digital Health Training for RACMA Members" authored by the Royal Australasian College of Medical Administrators (RACMA) in 2020 begins by calling on the reader to picture a world where automation is heavily embedded in the healthcare journey: with holographic doctors providing an infinitely scalable service with greater accuracy and at a fraction of the cost compared with today's human-based healthcare delivery models. The paper poses the ethical question: "At what point will we have to ask ourselves whether a human doctor should be permitted to deny a safer, more accurate, and less costly service to patients provided by robotics, AI, and automation?"

Although these hold great promise for healthcare into the future, and indeed may be the only viable solution to the growth in expenditure, they are not otherwise covered in this chapter but may be more deeply covered in other chapters or in a subsequent edition.

11.2.3 International Comparisons

International expenditure on healthcare varies widely, however many of the OECD nations spend a remarkably consistent proportion of Gross Domestic Product (GDP), indicating that as countries become more (or less) wealthy they use similar proportions on healthcare.

As noted above, the 2019 OECD average expenditure was 8.8% of GDP or US$4,097 per person. For Australia and New Zealand, these figures were US$5,130 (10.2%) and US$4,250 (9.0%) respectively, just slightly above the OECD average in both measures.

The US, by comparison, spends US$10,856 per person (16.7%) on healthcare, while Canada comes in at US$5,190 (10.9%). The equivalent figures for the United Kingdom are US$4,285 per person and 9.9% of their GDP.

Interestingly, the proportions of GDP spent on healthcare for the five countries listed above are not similarly reflected in healthcare employment. The US healthcare engages 13.6% of the workforce, Australia 13.3%, the UK 12.4%, Canada 11.4%, and New Zealand 10.5% (see Table 11.2).

This lack of alignment suggests that something other than raw employment numbers may be driving the costs. Indeed, using the number of medical staff per thousand population the ratios are further skewed with the USA having the fewest doctors per 1,000 population. Nursing is also not where the money is going with fewer US than Australian nurses.

There are likely to be a range of factors leading to this outcome, including geography and isolation, which may, for example, increase the required number of doctors in Australian regional areas.

Other factors of interest to economists are the relative profits made from healthcare—either by individuals or corporations—which may not be reflected in employment numbers.

Table 11.2 Comparison of five countries

Health spending	Cost per capita in US$	$ of GDP	% of employment	Doctors per 1,000 pop'n	Nurses per 1,000 pop'n
Australia	5,130	10.2%	13.3%	3.8	12.3
Canada	5,190	10.9%	11.4%	2.7	10.1
New Zealand	4,250	9.9%	10.5%	3.4	10.9
UK	4,285	7.5%	12.2%	3.0	8.7
USA	10,586	16.7%	13.6%	2.6	12.0

At current prices and PPPs in US dollars

OECD (2022), Health spending (indicator). doi: 10.1787/8643de7e-en (Accessed on 14 September 2022) https://data.oecd.org/healthres/health-spending.htm

Total expenditure on healthcare per capita for a range of other OECD countries is shown in Table 11.3 for all years between 2014 and 2020 (and 2021 where available).

It should be noted that the percentage of GDP may not always be a good indicator, but it is certainly a common one. To see why this can be an issue, a review of the GDP expenditure on healthcare for Ireland shows that it ranged from 7.5% of GDP in 2007, to 10.5% in 2010, only to fall again to as low as 6.7% in 2021. At the same time the health expenditure per person was growing, but not significantly faster than in other countries. The issue in this case was the sudden reduction in Ireland's GDP which occurred in the post-2008 Irish economic downturn. Accordingly, care must be taken when interpreting such statistics [1, 11].

11.2.3.1 Data Sources

As a medical administrator, it is important to have ready access to authoritative information

Table 11.3 Total expenditure on health per capita

	2014	2015	2016	2017	2018	2019	2020	2021
Australia	$4,563	$4,777	$5,037	$5,075	$5,194	$5,130	$5,627	
Austria	$4,858	$4,944	$51,96	$5,315	$5,519	$5,624	$5,883	$6,693
Belgium	$4,580	$4,807	$4,999	$5,121	$5,315	$5,353	$5,274	
Canada	$4,537	$4,635	$5,044	$5,150	$5,308	$5,190	$5,828	$5,905
Chile	$1,755	$1,834	$1,941	$2,120	$2,281	$2,297	$2,413	$2,596
Czech Republic	$2,565	$2,545	$2,671	$2,970	$3,129	$3,272	$3,805	
Denmark	$4,597	$4,727	$4,901	$5,113	$5,307	$5,360	$5,694	$6,384
Estonia	$1,821	$1,940	$2,097	$2,201	$2,364	$2,452	$2,729	$2,989
Finland	$3,956	$3,992	$4,104	$4,215	$4,330	$4,382	$4,566	
France	$4,627	$4,667	$4,928	$5,006	$5,099	$5,168	$5,468	
Germany	$5,152	$5,296	$5,669	$5,970	$6,282	$6,408	$6,939	$7,383
Greece	$2,011	$2,123	$2,258	$2,251	$2,315	$2,350	$2,486	
Hungary	$1,864	$1,891	$2,000	$1,997	$2,106	$2,094	$2,402	
Iceland	$3,600	$3,733	$3,932	$4,111	$4,236	$4,318	$4,620	$5,096
Ireland	$4,197	$4,295	$4,537	$4,683	$4,871	$4,947	$5,373	$5,836
Israel	$2,238	$2,310	$2,524	$2,626	$2,749	$2,791	$3,057	
Italy	$3,037	$3,089	$3,274	$3,376	$3,496	$3,565	$3,747	$4,038
Japan	$4,328	$4,516	$4,296	$4,413	$4,554	$4,611	$4,666	
Korea	$2,233	$2,492	$2,665	$2,802	$3,079	$3,277	$3,582	$3,914
Luxembourg	$4,707	$4,692	$4,864	$4,989	$5,292	$5,360	$5,596	
Mexico	$990	$1,063	$1,103	$1,100	$1,122	$1,117	$1,227	
Netherlands	$4,935	$4,927	$5,096	$5,254	$5,489	$5,649	$6,190	
New Zealand	$3,491	$3,501	$3,733	$3,842	$3,913	$4,250	$4,469	
Norway	$5,707	$5,727	$5,904	$6,234	$6,495	$6,476	$6,536	$7,065
Poland	$1,687	$1,819	$1,959	$2,063	$2,107	$2,232	$2,286	$2,568
Portugal	$2,538	$2,636	$2,815	$2,906	$3,134	$3,224	$3,348	$3,816
Slovak Republic	$2,010	$2,059	$2,040	$1,974	$2,009	$2,115	$2,134	
Slovenia	$2,499	$2,579	$2,738	$2,833	$3,045	$3,222	$3,498	
Spain	$2,858	$3,020	$3,149	$3,318	$3,427	$3,523	$3,718	
Sweden	$4,866	$5,004	$5,128	$5,219	$5,419	$5,388	$5,757	$6,262
Switzerland	$6,159	$6,466	$6,808	$6,866	$6,931	$6,942	$7,179	
Turkey	$1,007	$1,040	$1,129	$1,176	$1,205	$1,232	$1,305	
United Kingdom	$3,759	$3,806	$3,960	$4,059	$4,190	$4,385	$5,019	$5,387
United States	$8,926	$9,355	$9,718	$10,046	$10,451	$10,856	$11,859	$12,318

At current prices and PPPs in US dollars

OECD (2022), Health spending (indicator). doi: 10.1787/8643de7e-en (Accessed on 4 September 2022) downloaded from https://data.oecd.org/healthres/health-spending.htm

regarding health economics. One such source is www.oecd.org/health.htm which has a range of excellent web-based tools that are freely available by searching for "Health Spending" [11].

As with all data, however, statistics are refined over time. An illustration is that there are slight differences between the data published in the most recent "Health at a Glance" publication in 2021 OECD [1] and the current live data available using their interactive tool. Information for the most recent years is often an estimate, and as better data is submitted, static reports quickly become dated.

11.2.4 Public vs Private

Chapter 8 explores the private healthcare sector in more detail. From the perspective of health economics, however, one of the international and national debates relates to the optimal role of private healthcare providers in the delivery of healthcare.

The Australian setting, although not unique, is unusual. The Federal and State governments are largely responsible for separate sectors: with the private sector including GPs and the health insurance industry being funded or subsidised federally (as well as by patients), whereas the public sector is largely funded and managed by State Governments, and the Australian Health Reform Agreement (AHRA) acts as the key document which maintains the balance [12].

Over the years, numerous initiatives have been introduced to support the private sector and these are depicted along a timeline in Fig. 8.3 earlier in this book. Some authors have called into question the traditional view that supporting the private sector reduces pressure on the public system [13]. Other studies have indicated that there is little or no efficiency benefit that increased private subsidisation is associated with ***increased*** waiting times in public, and that public subsidies at the expense of public care may not be appropriate [14].

The Grattan Institute publication entitled *"The history and purposes of private health insurance"* is a particularly useful synopsis, and provides an interesting summary and description of private sector funding in the Australian setting [15].

11.2.5 Value = Quantity and Quality

Health economics is not only focussed on the outputs of healthcare but also the outcomes. This can be summarised as a concept of delivering "Value" where quality is just as important as quantity, if not more so.

$$\text{Value} = \frac{\$}{Q^2}$$

This can be expressed as a simple easy-to-remember equation where Value is the Cost divided by both the Quantity and the Quality of the healthcare provided.

11.2.5.1 Historical References: It's Not New!

Notwithstanding recent enthusiasm about "Quality Assurance", "Patient Safety", "Patient-centred Medicine", "Value-based Health Care", "Choosing Wisely" and the avoidance of "Low-Value Care", the concept is not a new one.

Hippocrates medical school opened in Cos over 2,400 years ago with a code of conduct that put the needs of the patient first and foremost. Similarly, Galen in 200 AD was keen to separate the disease from the needs of "this patient" in his approach to surgical practice [16].

More recently Florence Nightingale during the 1850s Crimean War noticed the correlation between the quality of the care provided and the outcomes—and was one of the first to call for a case classification or case-mix system of groupings based on the diagnosis (the core concept underpinning Diagnosis Related Groups or DRGs) to facilitate the comparison of cases from both a cost and a quality perspective.

In 1914 Dr. Ernest Codman, a Boston surgeon, called for a system for comparisons of outcomes and created a categorisation system based on a matrix of diagnosis on one axis and treatment procedures on the other, and encouraged patient follow-up at 12 months. By doing so he created

the first systematic Diagnosis Related Grouping system, even if they were not referred to as "DRGs" at the time [17]. Moreover, his approach, like Nightingale, Galen, and Hippocrates before him, has strong similarities to the "new" concepts expressed today under Values-Based healthcare [18, 19].

> *Really the whole hospital problem rests on one question: What happens to the cases? … We must formulate some method of hospital report showing as nearly as possible what are the results of the treatment obtained at different institutions. This report must be made out and published by each hospital in a uniform manner, so that comparisons will be possible. With such a report as a starting point, those interested can begin to ask questions as to management and efficiency.*—Ernest A Codman - Address to the Philadelphia County Medical Society, 1913 Codman [17].

Both Nightingale and Codman emphasised the importance of documentation. It is also of note that, as with anyone attempting to make inroads into clinical quality, Codman was not popular amongst his peers and was forced to resign from the Massachusetts General Hospital. In a footnote of reconciliation and recognition, he is remembered as the acknowledged founder of outcomes management in patient care, and the Codman Center for Clinical Effectiveness in Surgery at the Massachusetts General Hospital is named in his honour [20].

11.2.5.2 Value-Based Healthcare

Drawing on the US free market healthcare model, where competition is held as the driver of both quality and cost containment, Porter in 2004 suggested that a re-design was needed with a focus on value - encouraging employers to lead the way [21].

In 2010, Porter stated that "*Achieving high value for patients must become the overarching goal of health care delivery, with value defined as the health outcomes achieved per dollar spent"*, and described a hierarchy from tier 1, which focusses on survival and recovery, to tier 3 which included long term treatment sustainability and any consequences of therapy, but by then he was calling for clinicians to take the lead [22].

Porter's equation is not unlike the simpler one presented earlier, but perhaps a little more specific:

$$\text{Value} = \frac{\begin{array}{c}\text{The set of outcomes that}\\ \text{matter for the condition}\end{array}}{\begin{array}{c}\text{The cost of delivering those outcomes}\\ \text{over the full cycle of care}\end{array}}$$

The call for providers to lead the way echoes Codman's efforts nearly a century beforehand [23, 24]. Porter suggested funding "packages" or "*bundling*" of healthcare—spanning more than a single encounter. This approach will be discussed later as either Condition-Based Funding (CBF) or Population-Based Funding (PBF). Both approaches are not really novel, and both bring new challenges while assisting in solving earlier ones [25].

11.2.5.3 "Low Value" Care

A similar, but more targeted approach to value involves identifying specific treatments or interventions which are deemed to be of limited or no benefit to patients unless certain indications are present (for instance colonoscopies performed for constipation in patients under 50 years of age or a knee arthroscopies for simple osteoarthritis are examples of "Low Value" Care) [26].

An Australian private hospital study looking at 21 such procedures, revealed that between 20.8% and 32% were "low-value procedures" using narrow and broad indicators respectively. This amounts to between $A12.4 and $A22.7 million spent on low-value care per year on just 21 procedures in private, and more if the public sector were included [27]. Clinicians are more influential than consumers in the ongoing use of such procedures in the absence of strong regulatory or funding interventions [28, 29].

Some 30% of US healthcare expenditure is considered to be of "uncertain" value, and in a similar vein, it has been postulated that much of end-of-life care is low value with nearly 10% of all inpatient costs in Australia spent in the last year of life. Moreover, in the final 6 months, one in three older patients receive interventions that are unlikely to be beneficial [30, 31].

The question remains whether such procedures should be permitted at all, and if so, whether they should be paid for or subsidised by the public purse.

11.2.6 Insurance Pooling and "Universal" Healthcare

Many countries have some form of health insurance, which involves a pooling of financial risk. Often this is legislated or mandated at a national or regional government level requiring individuals to be covered—either with third-party insurers, or frequently as part of government-run programs such as the NHS in the UK, Medicare in Australia, and the New Zealand Health System.

Countries with "universal" healthcare systems covering the entire population automatically have strong purchasing power and can therefore exert downward pressure on the costs of healthcare. This is missing when there is competition between multiple purchasers for a finite service, forming a "sellers' market" for an essential item.

11.2.6.1 Individual Patient Payment

Perhaps the simplest and oldest approach is where the patient or their family pays directly out of pocket for healthcare, indeed this was the norm prior to the development of the first charitable organisations, followed more recently by health insurance and national health approaches.

11.2.6.2 Provider-Based Funders

The earliest form of "free" healthcare provision was provided by charitable and religious organisations that used subscriptions, bequests, or donations to pay for healthcare, which was then provided free of charge or highly subsidised, to the patient or client. In the case of charitable organisations, eligibility to receive care is commonly based on an inability to pay by other means.

Many such organisations used honorary senior medical staff who provided their services on a volunteer basis either free of charge, or for a token remuneration plus the reputational kudos gained from philanthropy and the enjoyment associated with teaching.

This practice continued in Australia well into the 1970s when Medicare was introduced, and gradually many such doctors became engaged as salaried medical officers on staff, or on a paid visiting basis, however, a few "honoraries" continue to this day [32].

11.2.6.3 Health Maintenance Organisations (HMOs)

HMOs are a special example of provider organisations that are also health insurers. In these models, the insurer owns and operates one or more healthcare facilities.

Many also act as simple insurance companies as well so that their members can attend other hospitals, particularly when travelling, or for services not provided within the HMO's owned and operated facilities.

One of the best-known US-based HMOs is Kaiser Permanente. At 12.6 million members, Kaiser is half the size of Australia's Medicare and double the size of the New Zealand health system. In some ways, they adopt many of the approaches associated with public universal-health systems such as a focus on outcomes, preventative health, continuity, and primary care.

One of the key differences is that the cost of membership often varies by age or health status rather than being means tested. On the other hand, public systems like those in the UK, Canada, New Zealand, and Australia are based on an allocation of state revenue which itself is based significantly on the tax levied on income or wealth [33].

Some employers, such as the military, may provide healthcare to their staff by directly employing their own doctors and nurses and pay for their facilities and consumables, and therefore act somewhat like HMOs, particularly when on deployment, or at sea on a warship, for example.

11.2.6.4 Insurance Separate from Provider

Just like motor vehicle or home insurance companies, health insurance companies are set up to share financial risk across their membership base. Likewise, they may impose exclusions or conditions in the form of waiting periods or limitations for pre-existing ailments, to filter out known high risks.

Public (government-owned) insurance schemes that fall short of single-payer health systems also exist, and may have elements that resemble private insurance organisations, but may also be subsidised by a broader taxation base in order to provide health cover to those otherwise unable to afford it.

The key feature, however, is that they neither employ nor run the healthcare facilities, and their cover is restricted to policy fund-holders or patients who meet an eligibility threshold. The US Medicare Part A system, for instance, provides hospital cover for patients over 65, who are eligible for retirement benefits from the US Social Security (or the Railroad Retirement Board) and who paid Medicare taxes while they worked, amongst other stipulations [34].

11.2.6.5 Single-Payer "Universal" Healthcare

Single-payer systems are often managed centrally by governments. A single insurer forms a natural *monopsony*, or single purchaser in the market, and can exert strong market pressure to reduce costs. Many believe such market power is not appropriate for private sector firms where profit is a motive.

Being universal, they are typically funded based on the ability to pay—usually through taxation, however, this is not always the case.

Universal coverage also has clear equity advantages, with no ability to select more profitable patients or "cherry-pick". Other strengths are cost containment and the ability to influence the types of services that are provided, and the ability to set minimum quality standards.

Such purchasing power concentrated in the hands of government is often resisted by supplier organisations, and these approaches are strenuously attacked by *"those who do well out of the old order of things"* when first suggested, to paraphrase Machiavelli [35], but are equally strenuously defended by the public when politicians are "courageous" enough to contemplate dismantling them once in place and accepted by the population.

11.3 Health Funding/Revenue Models

Across the world, there are a range of methods that the purchasers of healthcare use to negotiate, quantify and pay for the health services provided by healthcare providers. This purchaser-provider split is most easily identified when:

- a *single* patient pays out of their own pocket to,
- a *single* clinician for,
- a *single* healthcare service.

This simplest of funding models has been in operation since the first healer received a gift from a grateful patient. In recent times there has been a growing array of approaches to funding healthcare services which can appear daunting to understand, and initially, it may seem that there is no systematic structure underpinning the myriad of terms and systems used. Fortunately, a simple classification can be described based on the essential characteristics of the methods of funding.

11.3.1 Funder and Provider Aggregation

Two characteristics define all known funding methodologies. Unfortunately, they are sometimes confused and even used interchangeably but it is important to consider them separately:

1. The first, as outlined in the previous section, is the level or method of aggregation on the *funder* side, that describes ***who*** is paying.

(a) Are patients or clients paying themselves,
(b) or have they grouped together as members of a mutual fund or an insurance company,
(c) or a health maintenance organisation,
(d) or part of a national health single-payer scheme such as the New Zealand health system, Medicare in Australia, the NHS in the UK, and many others?

2. The second which we will discuss below is the level of aggregation (sometimes called bundling) on the **provider** side that describes ***what*** is being paid for:
   (a) is it an hour of the surgeons' time?
   (b) an operation?
   (c) an episode of care?
   (d) care for an entire condition?
   (e) or care for a whole population?

11.3.2 "Intermediate Products" and the "Vending Machine" Metaphor for Healthcare Production and Funding

Although Activity-Based Funding, or "ABF" is increasingly common, it is only one of a group of five models that are used around the world.

The first three map neatly to the inputs and outputs of the two-stage process of healthcare as described by Bob Fetter, the father of DRGs, who used the management cost-accounting term *"Intermediate Product"* to describe the output of the first process and the input to the second: [36].

1. Raw materials and Labour are combined to produce the Intermediate Products of care by the departments of the hospital. These tests, investigations, procedures, medications, days of care, etc. are the building blocks of the care process.
2. Physicians then order and combine unique tailor-made combinations of Intermediate Products for the successful treatment of an individual patient episode of care.

In the late 1980s, the author was engaged in explaining this concept to clinicians and developed a diagrammatic metaphor where vending machines represent the departments of the hospital selling Intermediate Products to a doctor wheeling a patient past the front of the machines. A more professionally drawn version was commissioned and is reproduced in Fig. 11.1, but alas the identity of the commercial artist was lost.

11.3.3 The Five Funding Models

In summary, the five models are:

1. *Expenditure-Based Funding (EBF)* where income or budget is set without a clear, if any, link to activity.

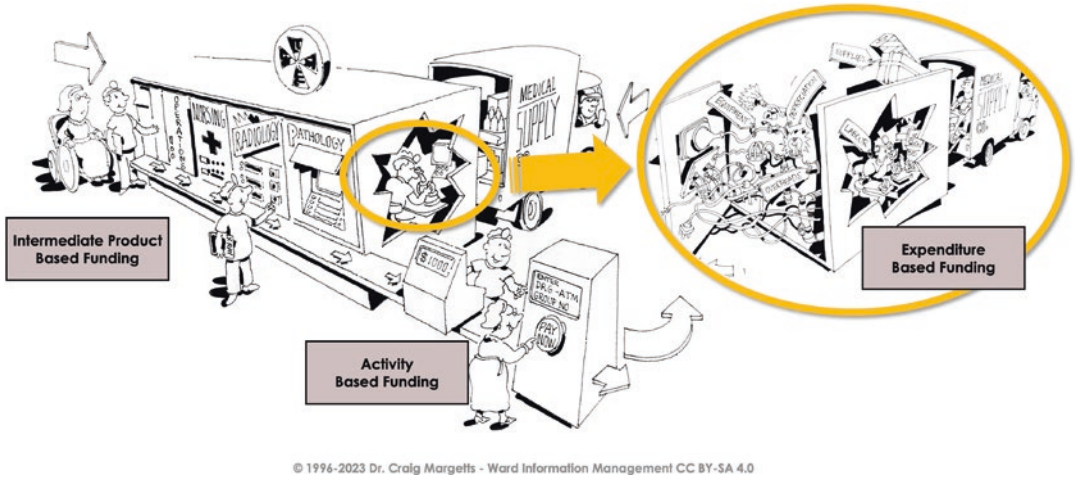

Fig. 11.1 Healthcare as a two-stage process—mapped to three of the five funding models. © Dr. Craig Margetts - Ward Information Management (CC BY-SA 4.0)

2. *Intermediate Product-Based funding (IPBF)* pays for identifiable components of an episode of care: an example is a "Fee-for-Service" (FFS) payment for an operation, a doctor's visit, a medication, or an X-Ray.
3. *Activity-Based Funding (ABF)* pays for an entire episode of care—an admission or an outpatient visit, including any associated investigations, treatments, and care.
4. *Condition-Based Funding (CBF)* sees a patient's care bundled over time, perhaps for a year, for the treatment of a condition like Renal Dialysis, or for the term of a pregnancy.
5. *Population-Based Funding (PBF)* where funding to a healthcare organisation is based on a described geographical population, such as an Australian State or a New Zealand District. Populations may also be defined by membership of an organisation or another characteristic such as age instead of geography. Healthcare providers are typically funded based on a capitation basis within a catchment area.

EBF, IPBF, and ABF relate to the processes of a healthcare provider or facility and are applicable up to the level of an area health service.

CBF and PBF work well at the health department or state level but are challenging to manage at the level of an individual facility or clinical department.

11.3.3.1 Aside: The "Zombie" Options

CBF and PBF have been repeatedly promoted over the past 30–40 years, only to be abandoned due to issues, particularly around the implied restrictions in patient freedoms to travel, or to be treated at other facilities; not to mention the overhead costs that arise when healthcare providers start becoming healthcare purchasers of services whenever their patients are treated in neighbouring facilities.

Undaunted these models are resurrected every 7–9 years, coinciding with two half-lives of health ministers and senior health officials who, after hearing of such models, mistake them for new ideas, only to have them wither and die again, awaiting their next resurrection, just like the zombies in a b-grade teen movie.

TIP: As with all models, there are underlying gems that should be salvaged regardless of the funding model being implemented. These include funding for multidisciplinary team meetings and complex case committees where the focus is on the whole patient over the longer term. Seeking and measuring patient-reported experience and outcome measures as well as efforts to avoid admissions and to empower patients are to be encouraged. The development of increasingly sophisticated care plans spanning and preventing admissions are further illustrations. Such approaches can empower patients to self-manage their own conditions in the community and are simply good healthcare.

11.3.4 Funding Models Vs. Purchasers

With four purchaser groupings and five funding models, there are 20 possible combinations, but not all are viable. Table 11.4 illustrates the 13 combinations that tend to be used in practice.

Table 11.4 Funders vs funding models

	Individual Patients	Insurance Funders	Provider Funders	Single Payer
EBF			✓	✓
IPBF	✓	✓		✓
ABF	✓	✓		✓
CBF	✓	✓		✓
PBF			✓	✓

This matrix identifies the common models used by patients, insurance companies or governments to purchase healthcare from healthcare providers. ✓ indicates models in common use

The first and the last of the funding models (EBF and PBF) represent funding for care for *groups of patients*. Notwithstanding bequests and donations, individuals and insurance companies tend not to provide EBF or PBF to healthcare providers.

The middle three of the five (IPBF, ABF, and CBF) are defined by care to *individual patients*. Individuals and insurance organisations tend to gravitate to these models.

Single Payer approaches have the luxury of being able to work in any of the five models.

11.3.4.1 Funding the Funders

It is a separate question of how the funding bodies, in turn, receive their income: non-government insurance companies and HMOs typically levy membership subscriptions which in some cases are paid by other parties, such as employers. Single-payer health purchasers are often government-run and are commonly funded via various forms of taxation.

11.3.4.2 Providers as Purchasers?

Within and ***between*** healthcare organisations, one or more of these models may be used for budgeting and payment.

For instance, employed staff are typically paid on a salary or hourly rate (a form of EBF) rather than fee-for-service (IPBF) within the organisation; the exception being sole traders such as Visiting Medical Officers in some Australian States.

Similarly, individual facilities or services within an HMO may have their budgets and funding distributed using ABF, or IPBF.

An example of Population-Based Funding at a broader scale is illustrated in the arrangement between the Australian Federal government and the States of Australia even though it is then distributed to individual facilities via Activity-Based Funding for the most part.

11.3.4.3 Summary

The array of funding processes can be broken down into variations and combinations of these basic *five* funding models sourced from *four* groupings of patients.

Although increasing aggregation on the purchaser side magnifies the relative market power of the healthcare consumer, insurance company, or single-payer to put downward pressure on healthcare costs, it is the model of funding that defines the cost and quality risks that the medical administrator or clinical leader must attend to and manage predominantly.

The next chapter will review the management implications of each of the five funding models and will provide a more detailed review of the characteristics, strengths, and challenges of each.

Prior to concluding this chapter, however, we will take a deeper look at the internal mechanics of Activity-Based Funding.

11.4 ABF: A Deeper Dive

Although ABF is only one of the five models, it continues to be the dominant approach to funding, particularly in acute healthcare, with increasing use in both the public and private sectors. Before turning our attention to the challenges of managing under the other models, a deeper understanding of the mechanisms of ABF is warranted.

Armed with a more detailed knowledge of the mechanics of ABF, the medical administrator will be better equipped to leverage its power to facilitate quality comparisons and simplify funding negotiations, both resulting in benefits to patients.

11.4.1 ABF History

The historical focus of Case-mix and Activity-Based Funding in Australia and New Zealand were quite different and each will be covered in turn.

11.4.1.1 New Zealand

New Zealand traditionally used a population-based funding formula (PBF) to distribute the health "Vote" (the funding allocation by the New Zealand Government) to twenty District Health Boards (DHBs) who then used Activity-Based

Funding to purchase care from each other, for instance when patients travel.

To varying degrees ABF has also been used to determine internal budgets for facilities, however, the initial emphasis was on cost control, and for this reason, many clinicians felt it was "black box" medicine with accountants, rather than clinicians at the helm.

In recent times the Australian Refined Diagnosis Related Group (AR-DRG) classification system has been adopted, with the New Zealand government contracting the Australian Independent Health and Aged Care Pricing Authority (IHCAPA) for a localised New Zealand version [37].

Of note, the New Zealand health system is currently undergoing a major reform involving the abolition of the DHBs and the centralisation of healthcare management under a single structure named Health New Zealand, to be modelled after the National Health Service (NHS) in the UK, so the ultimate balance between the use of PBF versus ABF remains to be seen.

11.4.1.2 Australia

Although Australia commenced its journey shortly after New Zealand, the emphasis from the start was clearly as a funding mechanism, rather than a cost control tool, and the implementation saw a clear separation of the State Health Departments as purchasers, from the Hospitals as providers.

This gave momentum, particularly in Victoria, where it was first introduced in 1993 as the predominant funding model for acute care, and clinicians welcomed the opportunity for uncapped growth, at least for a brief time.

ABF funding spread gradually through other states and territories until 2008 when an agreement was made for a nationally consistent approach, and the Independent Hospital Pricing Authority (IHPA) was formed to continue the development of the AR-DRG system and to publish a National Efficient Price (NEP) for an average inpatient separation. This enabled funding arrangements to be specified in a more or less transparent manner.

11.4.2 Four Criteria for a DRG System

In the original design, four criteria were stipulated, and these have remained current in all subsequent refinements:

1. Class definitions are based on *information routinely collected* by hospitals. (Remembering ICD coding was in use for statistical reporting and international comparisons for many years before DRGs were invented),
2. A *manageable number* of classes (generally considered to be somewhere between 500 and 1,000),
3. *Similar resource intensity* patterns within a given class (**Inputs**),
4. *Similar types of patients* in a given class from a clinical perspective (**Outputs/Outcomes**) [36].

Although not perfect, the DRG system provided, at relatively low overhead, a mechanism to align inputs (costs) to outputs (episodes) for the first time, and in a way that had meaning to both clinicians and managers. It is this combination of concepts, that has led to the broad use of DRGs as a central element of ABF across the globe.

11.4.3 ICD-10-AM Coding

The determination of most funding classifications starts with a process known as *"Coding"* where the clinical notes made by doctors, nurses, and allied health professionals are converted into International Classification of Disease (ICD) codes.

It is the globally uniform ICD coding system, now controlled by the World Health Organisation (WHO), that allows for the incidence of diseases in different countries to be measured and compared.

According to Encyclopedia Britannica, the ICD system was first implemented in 1893, so it clearly pre-dated DRGs [38]. Since they were already being routinely collected, ICD codes served as ideal data to enter into algorithms for the calculation of DRGs. Although a patient

admission may have many ICD codes, the *"grouping"* process results in a single DRG per patient, per episode of care.

A local version of the ICD system has been created for Australia and New Zealand and this is called ICD-10-AM or the International Classification of Diseases, Tenth Edition, Australian Modification. The "Australian Modification" involves replacing the original ICD Procedure Codes with the Australian Classification of Health Interventions (ACHI) codes—themselves derived from the Commonwealth Medicare Benefits Schedule (MBS) but with an additional two digits added to give finer detail.

The current version of ICD-10-AM is in use in Australia and New Zealand in its twelfth ***revision*** of the tenth ***edition*** and contains a total of 28,061 codes as outlined in Table 11.5. Other countries including the Republic of Northern Ireland and Saudi Arabia have also adopted ICD-10-AM.

In addition to the codes, there are 139 *coding standards* defined to ensure that the coding practices are not only consistent across Australia but also internationally, so that health economists, planners, and health researchers can be sure that ICD-10 codes are comparable throughout the world.

Table 11.5 ICD-10-AM/ACHI/ACS

Type of Code	Number
Diagnosis Codes	17,268
Morphology (neoplasms)	2,895
ACHI Procedure Codes	6,505
ACHI Blocks – used for structure	1,393
Total	**28,061**
Australian Coding Standards (ACS)	**139**

Twelfth edition
Ref: https://www.ihacpa.gov.au/resources/icd-10-amachiacs-twelfth-edition

11.4.4 ABF: The Fundamentals

Figure 11.2 represents the basic approach common to all ABF systems.

11.4.4.1 Episode Volume

Essential to an Activity Base Funding model is the defining of the activity unit to be counted. The individual patient episode count (an admission or an ambulatory care visit) is the basis of ABF. Sometimes a single hospitalisation can be counted as more than one episode, however, as is the case when an Acute Patient moves to a Sub or Non-Acute Patient (SNAP) phase of their treatment: for example, rehabilitation or palliative care. This is considered a second episode, even though it is within one hospital admission.

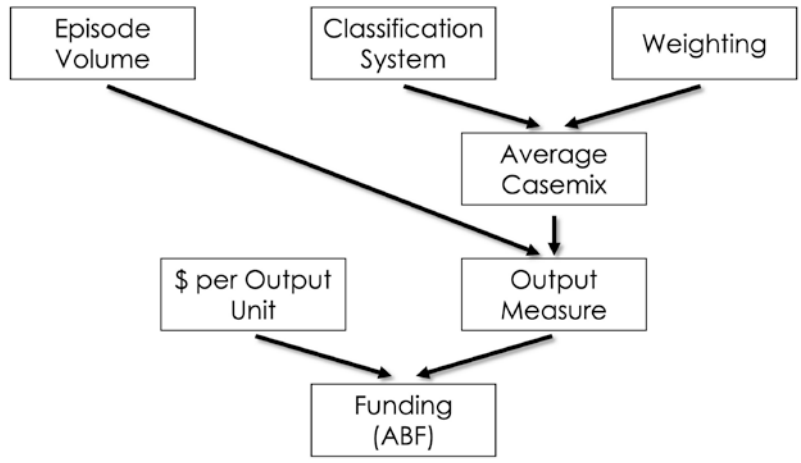

Fig. 11.2 Casemix and ABF. © Dr. Craig Margetts - Ward Information Management (CC BY-SA 4.0)

11.4.4.2 Current Australian Classification Systems

A fundamental requirement of an episode funding approach is the development of a nomenclature and pricing for each episode so that the mix of cases, or "*Casemix*" can be considered as well as a simple count of inpatient separations or ambulatory care episodes.

The initial approach focussed on inpatients, and the most widely used categorisation is the *Diagnosis Related Group (DRG)* system developed by Bob Fetter in 1975 and first used for funding purposes by the US Medicare program in 1981 [18, 36]. Table 11.6 outlines the history of ABF, DRGs, and Casemix.

There are many classification systems currently in use with Australian Refined Diagnosis Related Groups (AR-DRG v10.0) used for Acute Inpatients in Australia and New Zealand. There are *795* DRGs in Version 10.0 and *801* in Version 11.0 released on 1 February 2022 for use from 1 July 2023.

Five other classification systems are also in use or development and are published by IHACPA for non-acute settings [41].

The current versions are:

1. *AN-SNAP v5.0* - Australian National Subacute and Non-Acute Patient) classification with *89* end classes.
2. *AECC v1.0* - Australian Emergency Care Classification (AECC) which is replacing Urgency Disposition Groups. (UDG v1.3).
3. *Tier 2 v7.0* - A Non-Admitted Services Classification for ambulatory care visits based on specialty with *1340* end classes. (Tier 1 is no longer used and was based on the clinic.)
4. *AHMCC v1.0* - Australian Mental Healthcare Classification with *91* end classes.
5. *ATTC v1.0* - Australian Teaching and Training Classification with *20* end classes.

In Australia and New Zealand, the Independent Health and Aged Care Pricing Authority (IHACPA) is responsible for both the creation and maintenance of the groups, but also to undertake costing studies to determine relativities in cost between each element within these classifications, and further details can be obtained from:

- https://www.ihacpa.gov.au/service-categories
- or https://www.ihacpa.gov.au/health-care/classification

Table 11.6 A brief history of DRGs and ABF

1852	Florence Nightingale suggests a system of categorisation of cases to track the cost and benefits to patients
1914	Dr. Eugene Codman referred to "The product of a hospital" as a conceptual method to define a uniform output with which to compare quality
1967	A group of Yale physicians ask Bob Fetter for a way to apply quality control to healthcare by grouping diagnoses
1975	US Medicare program and the Bureau of Quality Assurance fund Bob Fetter to develop a categorisation system
1981	Bob Fetter produces the Health Care Financing Administration (HCFA) DRG Version 1 with 327 groups
1988	Dr. Craig Margetts begins working with Casemix and Clinical Costing
1989	Australian National Casemix Development Program launched
1992	Australian National DRGs (AN-DRGs) released, and the first National Costing Study commenced
1993	Australian Medicare Agreement five-year Casemix Strategic Plan
1993	Victorian Government "pays" for services rather than "funding" hospitals using DRGs and introduced Weighted Inlier Equivalent Separations (WIES) as the unit of activity
2008	Council of Australian Governments (COAG) agrees to a nationally consistent *ABF* approach as part of the *National Partnership Agreement on Hospital and Health Workforce Reform*
2011	Independent Hospital Pricing Authority established to continue the development of Activity-Based Funding in Australia and expanded ABF into a range of healthcare outside hospital admitted patients and re-named WIES to National Weighted Activity Units (NWAU)
2022	IHPA re-named to Independent Health and *Aged Care* Pricing Authority (IHACPA) to reflect broadening of scope

References: [17, 18, 36, 39, 40]

11.4.4.3 Cost and Revenue Weightings

Each DRG is assigned relativity or "weight" compared to an "average" DRG. This process is done in Australia by IHACPA using individual patient costing data submitted by public hospitals

Table 11.7 Highest volume AR-DRGs

AR-DRG	Seps	ALOS	Av. cost
L61—Haemodialysis	1,271,068	1.0	$606
R63—Chemotherapy	272,429	1.0	$2,126
F74—Chest pain	112,322	1.1	$899
G48—Colonoscopy	92,106	1.1	$2,565
C16—Lens interventions	59,826	1.0	$3,176

Data from round 24 of the IHPA NHCDC analysis for the 2019–2020 financial year [42]
NB: ALOS average length of stay or average "LOS"

(and separately by some private hospitals). In the latest round 24 data was collected from 552 unique public hospitals with costed patient-level data for 39,702,010 encounters, of which 6,141,848 were admitted acute separations [42]. A sample of the highest volume AR-DRGs is shown in Table 11.7.

The average cost per inpatient episode in Round 24 was $5,335 and this is given a relativity or weighting of 1.0000 by definition. The average is also used to establish the National Efficient Price in 2022 after a CPI adjustment is applied.

The average cost for each AR-DRG is then divided by $5,355 to calculate relativity or cost weight for each one, so a heart transplant results in 36.56 weighted separations and a colonoscopy of major complexity 1.24.

11.4.4.4 Outliers as Equivalent Inliers: Acute Care

In the case of acute inpatient episodes, an average Length of Stay (LOS) is calculated for each DRG as part of the National Health Cost Data Collection (NHCDC). High and low boundary points are determined: Originally set at 1/3 and three times the average LOS for each AR-DRG, they are now calculated on regression analysis. For specific details please see the National Pricing Model Technical Specification on the IHACPRA website. Patients with LOS between these boundary points are considered LOS "inliers" and they receive the DRG weight unmodified (see Fig. 11.3).

For LOS "outliers", an adjustment is made which varies from DRG to DRG to discount the weight for short-stay outliers and to apply small additional per diem weights to long-stay outliers. There are two ways to approach this calculation, but both arrive at the same result.

The original Victorian model applied this adjustment to the number of separations within a DRG to arrive at a total number of "Inlier Equivalent Separations" or IES. This was then multiplied by the DRG Weight for that DRG to get a Weighted IES or WIES.

The alternative approach is to apply the adjustment to the weight and multiply this adjusted weight by the separation to get a Weighted Activity Unit or WAU (pronounced "wow"), the national version of which is referred to as "N"WAU. Some states have their own versions, for instance, Queensland also has a QWAU as well as an NWAU calculation for example. Either way, the result will be the same provided the parameters are the same.

11.4.4.5 Output Measure: WIES Becomes WAU

With the inclusion of ambulatory care into ABF, referring to WAU became more appropriate than converting outpatient visits to fractions of an inpatient stay, and WAU is now regarded as the standard unit of activity which forms the basis of Activity-Based Funding in Australia and New Zealand, however "WIES" is still used as a term in Victoria, much as "QWAU" is used in Queensland.

11.4.5 Private Practice in Public Facilities: An IPBF Fly in the ABF Ointment?

In Australia, all eligible inpatients in public hospitals *must* elect to be private or public as a requirement of Sections G14-G23 of the National

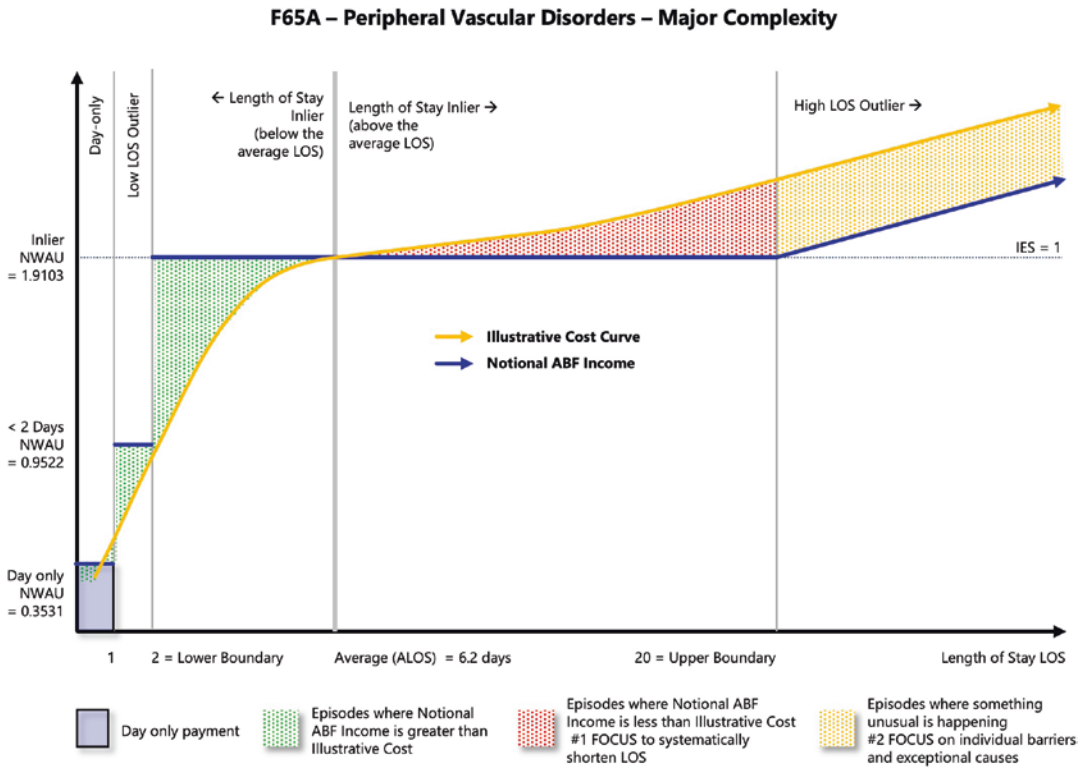

Fig. 11.3 Length of stay adjustments to acute inpatient Activity-Based Funding. © Dr. Craig Margetts - Ward Information Management (CC BY-SA 4.0)

Health Reform Agreement (NHRA) published by the Council of Australian Governments (COAG). Indeed it is prohibited for a hospital employee to direct patients or their legal guardians toward a particular choice (in *either direction* [my emphasis]) [12].

Further, for outpatients, all that is required is a named referral to a specialist with a right of private practice and the agreement of the patient to be private.

This leads to several anomalies:

1. IHACPA has determined that, as an additional payment has been received via Medicare or private insurance, the weighting (not the price) should be reduced. Accordingly, the NWAU for a public and a private patient now differ—and in the case of outpatients, there is zero NWAU. As a result, NWAU is *no longer a useful or reliable measure of hospital output* which is frustrating as many budgeting approaches are based on throughput. For this reason, Queensland developed QWAU as a more meaningful and consistent measure of activity that does have this discrepancy, and similarly, Victoria has, until recently, continued to use WIES for a similar purpose.
2. Medicare billing often goes to the specialist, in whole or in part; leaving little or no revenue to pay for the outpatient clinic and a reduced amount to pay for inpatient care.
3. All consequential billing must follow suit as clause G20 stipulates that "Where a patient chooses to be treated as a public patient, components of the public hospital service (such as pathology and diagnostic imaging) will be regarded as a part of the patient's treatment and will be provided free of charge". This means that a public outpatient can't have private pathology /radiology or vice versa. This has, on several occasions, caused significant issues. For instance, radiologists in many jurisdictions rely heavily on private billing to support their incomes.

4. Finally, many doctors, encouraged by the private health insurance industry lobbyists and industrial groups, falsely believe that this approach amounts to "double dipping" and may refuse to allow billing in their names. This can, paradoxically, result in reduced funding for public patients as the national agreement calculations may apply a private patient discount even where the local specialist has not billed Medicare—resulting in a situation sometimes described as "skinny dipping" to the detriment of their own hospital and department funding, and ultimately to patient access to care.

There are some who feel that the abolition of private patients altogether would simplify the accounting and save money, as well as making NWAU a useful measure of activity once again. Against this careful negotiation with adversely affected doctor groups would be required. Ironically, in some cases, the same bodies who called for the ending of "double dipping" are now the fiercest opponents to its abolition!

11.4.6 NEC and NEP

As mentioned earlier the IHACPA costing studies determine the average cost. In round 24 of the NHCDC, this was $5,335 in 2009–20 financial year. After allowing for CPI, the *National Efficient Price* (NEP) is determined and published annually for larger hospitals, and a *National Efficient Cost* (NEC) is published for small rural hospitals, consisting of a fixed component and a per-NWAU component. Both can be found in the National Efficient Price Determination available annually on the IHACPA website. The 2021–22 values are outlined in Table 11.8. As this is updated annually, current values should be sourced from the IHACPA website.

Table 11.8 IHACPA NEC and NEP for 2021–22

NEP: National Efficient Price = Average cost of an admitted episode of care in a public hospital	**$5,797** per NWAU
NEC: National Efficient Cost = Average cost for small rural hospitals	**$M2.265** fixed *plus* **$5,850** per NWAU

Prices in $A

Ref**:** NEP and NEC determinations and the pricing framework infographic available from https://www.ihacpa.gov.au/resources/national-efficient-price-determination-2021-22

11.4.7 Activity-Based Funding Calculation

Using inpatients and AR-DRGs as an illustration, the following steps determine the overall funding:

1. The clinical documentation for the episode of care is reviewed and coded according to the Australian Coding Standards using the International Classification of Diseases—Australian Modification—ICD-10-AM/ACHI/ACS Twelfth Edition.
2. This information along with patient age, etc. is fed into "Grouper" software to assign a single AR-DRG for each inpatient (or the equivalent code for ambulatory patients, emergency patients, etc.).
3. The appropriate weight is identified from a Table published by IHACPA, with a discounted weight applied for private patents as outlined above.
4. An adjustment for length of stay is made for inpatients if required for short- or long-stay outliers to determine the NWAU per patient.
5. The result is an NWAU value expressed as a number with four decimal places per patient episode and aggregated to make a total NWAU for the facility.
6. The Total NWAU is then multiplied by NEP to arrive at the notional Activity-Based Funding. (Or the NEC in the case of small rural hospitals).

11.4.8 AR-DRGs

As outlined above, the DRG system in use in Australia and New Zealand is currently the Australian Refined Diagnosis Related Group version 10 released in mid-2019 and implemented in July 2020. Version 11 has been released and will be implemented in July 2023.

11.4.8.1 Structure and Nomenclature

The structure of the AR-DRG code typically consists of:

- *A letter*, representing one of the 23 Major Diagnostic Categories (MDCs),
- *Two numbers* representing the Adjacent DRG (ADRG) within the MDC—with interventional partition DRGs having numbers under 50 and medical DRGs being over 50, and
- *A letter* (A, B, C, or D) indicating complexity splits ADRGs if required, into individual DRGs with "A" being the most complex, and therefore carrying the highest weight. If there is no split, the letter "Z" is used to avoid confusion with an ADRG which could occur if left blank.

This structure covers the vast majority of the AR-DRGs but there is a small additional group:

- There is a group of AR-DRGs known as "Pre-MDC" which relate to ventilation, tracheostomy, and ECMO and are procedure rather than diagnosis-related (with a first letter of "A").
- MDC 21 (Injuries, Poisons and Toxic Effects of Drugs) is split into two—with multi-trauma having its own letter "W" and the remainder starting with "X".
- Two numeric ranges with AR-DRGs starting with "8" relating to General Interventions not related to the principal diagnosis and "9" being for various forms of "error" AR-DRGs.
- And as a final "fun fact" for a trivia quiz—there are no AR-DRGs starting in "S"!

11.4.8.2 Splits

Table 11.9 demonstrates that the vast majority of AR-DRGs are part of a set of ADRGs that are split based mostly on complexity (a few are split on length of stay). Indeed 78% of ADRGs have an A, B, C, or D split and this translates to 89% of individual DRGs.

An illustration of a few AN-DRGs along with their splits, associated Price Weights, and notional revenue (Price weight x NEP at $5597) is shown in Table 11.10. There are significant differences in the funding, as well as the Average LOS (ALOS) which is used to calculate a Relative Stay Index (RSI) so ensuring the correct DRG is assigned is important.

Table 11.9 Number of splits in AR-DRGs

Number of splits	ADRGs	DRGs
No split (Z)	87 (22%)	87 (11%)
2 (A or B)	227 (57%)	454 (57%)
3 (A, B, or C)	78 (19%)	234 (29%)
4 (A, B, C, or D)	5 (1%)	20 (3%)
Total	**397 (100%)**	**795 (100%)**

Version 10 AR-DRG

11.4.9 The Importance of Good Documentation

In repeated unpublished studies by the author and Ms. Michelle Cope, Director of Clinical Information at Redcliffe Hospital, Queensland, Australia, clinical coding is found to be 100% accurate around 70% of the time (Fig. 11.4).

The remaining 30% is divided up as follows:

- Only 5% is coder error.
- A further 5% relates to ambiguous or illegible clinical documentation misinterpreted by Coders.
- In 20% of occasions the clinical documentation itself was wrong or simply missing altogether.

In addition, many co-morbidities were incorrectly categorised as complications.[2] This was almost entirely due to medical, and to a lesser degree nursing and allied health staff failing to record that a condition was present on admission.

The importance of documentation accuracy cannot be overstated. The above studies were commissioned due to an apparently high stan-

[2]The key difference between a co-morbidity and a complication is whether it was present on admission. A flag is set for every diagnosis to distinguish these, but they must be documented on the admission notes for this to be a valid entry.

Table 11.10 Selected AN-DRGs with and without splits

ADRG	DRG	DRG description	ALOS	Price weight	@ NEP * $5597
D10	D10Z	Nasal Interventions	1.0	1.0064	$5,632.82
F20	**F20Z**	**Vein Ligation and Stripping**	**1.2**	**0.9209**	**$5,154.28**
H08	H08A	Laparoscopic Cholecystectomy, Major Complexity	5.7	2.8758	$16,095.85
H08	H08B	Laparoscopic Cholecystectomy, Minor Complexity	2.1	1.5859	$8,876.28
H07	**H07A**	**Open Cholecystectomy, Major Complexity**	**12.6**	**5.9483**	**$33,292.64**
H07	**H07B**	**Open Cholecystectomy, Intermediate Complexity**	**7.0**	**3.7538**	**$21,010.02**
H07	**H07C**	**Open Cholecystectomy, Minor Complexity**	**4.3**	**2.6092**	**$14,603.69**
B70	B70A	Stroke & Other Cerebrovascular Disorders, Major Complexity	13.0	3.9505	$22,110.95
B70	B70B	Stroke and Other Cerebrovascular Disorders, Int. Complexity	6.4	2.0269	$11,344.56
B70	B70C	Stroke and Other Cerebrovascular Disorders, Minor Complexity	3.9	1.1542	$6,460.06
B70	B70D	Stroke and Other Cerebrovascular Disorders, Transferred <5d	1.9	0.6917	$3,871.44

Version 10 AR-DRG

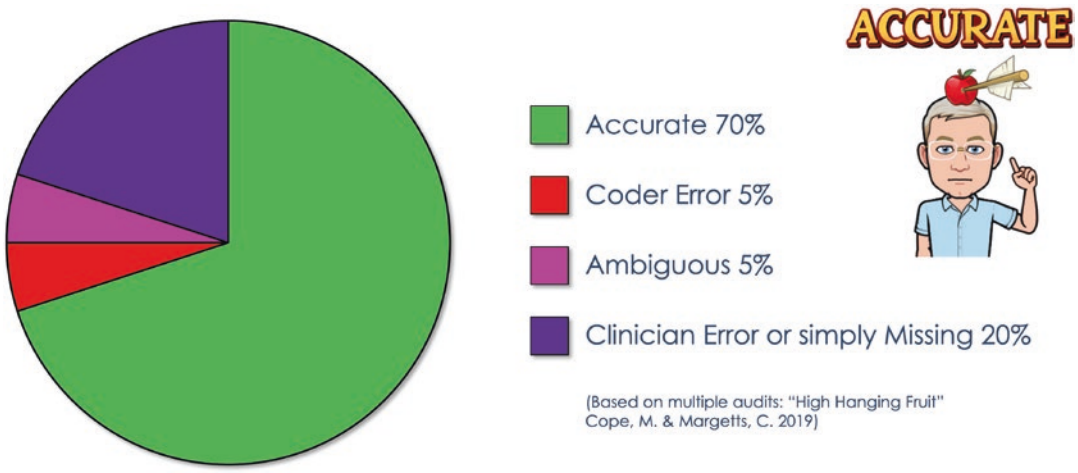

Fig. 11.4 Documentation accuracy

dardised mortality rate accompanied by a Hospital Acquired Complication (HAC) rate of 3% in a range of key sentinel complications—again higher than the 2% benchmark.

When this was identified, a process was undertaken to review the documentation in consultation with the clinical teams, to ensure that the correct care type "04-Palliative" was recorded instead of "01-Acute"—but only where the patient was genuinely being admitted for palliative care.

Concern was initially expressed by the finance department that there would be a budget impact of losing a significant number of acute NWAUs as a by-product of improving the documentation and correcting the data, however, this proved to be unfounded.

At the conclusion of the clinical documentation improvement the following results were noted:

- The Health Roundtable (HRT) Hospital Diagnosis related Standardised Mortality Ratio (HDxSMR) fell from *127%* (a 2 standard deviation outlier) to *84%* which was below the peer group average.
- The Hospital Acquired Complication (HAC) rate fell from *3%* to *1%*.
- At the same time an additional *888.8833* NWAU, worth an additional *$4.4 million* in notional revenue, was identified and submitted.

This kind of improvement has been repeatedly found—to the extent that the Royal Brisbane and Women's Hospital now has funded a permanent RMO position in Medical Administration. 20% of their time (1 day a week) is spent reviewing and improving clinical documentation and they generate sufficient additional NWAU in a single month (5 days) to fund the position for an entire year!

TIP: As a medical administrator, an early consideration in all unexpected quality and financial challenges should be to review the quality of the clinical documentation. This is particularly the case where (junior) staff are fatigued or are facing burn-out as one of the earliest signs is a deterioration in clinical documentation, which translates into lower NWAU and worsening quality markers.

Ironically, the deterioration in documentation makes it harder to demonstrate that there is both the workload and the revenue to justify additional FTE.

This is another illustration of the deep connection between financial and quality considerations for the medical administrator to keep front of mind.

11.5 Conclusions and Summary

The economics of healthcare and its funding varies throughout the OECD but there are some underlying lessons to be learned. Some take-home messages include:

- Healthcare behaves a little like a luxury ***between*** countries, but ***within*** a country, it behaves more like an essential service, and price signals may not be the best way to control expenditure, indeed the country with the greatest emphasis on cost signals has the most expensive healthcare.
- Increased expenditure does not necessarily translate into better care, more clinicians, or better outcomes.
- Greater aggregation of patients (as purchasers) results in increased downward pressure on healthcare costs, and tends to promote health equity, with the ultimate level of aggregation being single-payer systems such as the NHS.
- There are four levels of aggregation of patients/purchasers from an individual, to insurance, to provider-funders, and ultimately to single-payer systems.
- These *four* aggregations fund healthcare in one of *five* funding models—Expenditure, Intermediate Product, Activity, Condition, or Population-Based Funding.
- The first three EBF, IPBF, and ABF mirror the internal production process of large healthcare facilities where expenditure is first converted into Intermediate Products which are then utilised by doctors and other clinicians to combine with a patient's episode of care.
- Condition-Based Funding (CBF) and Population-Based Funding (PBF) have been suggested repeatedly for many years and repeatedly struggle to gain traction due to a mismatch between the cost drivers and the span of influence of healthcare provider organisations.
- Care must be taken when proposing initiatives borne out of necessity from other health systems, facing problems that may not currently exist in Australia and New Zealand. Caution is prudent prior to adopting cost-saving and quality solutions from countries with the poorest track records.

11.6 Further Reading

For a deeper dive into Health Economics and the topics raised here the following resources are worthy of consideration.

- *"Healthcare at a Glance 2021 OECD Indicators"* provides an excellent and informative summary of *healthcare expenditure and outcomes across the 38 OECD countries* and can be downloaded via www.oecd.org/health/ by clicking the link at the bottom of the page. In addition, on the same page, is a link to the OECD Health Statistics including Health Expenditure and Financing or you can click here …for hours of fun with interactive health data!
- A deeper understanding of the subject of *health economics* McPake, Normand, Smith, and Nolan's 2020 book *Health Economics: An International Perspective* is published and downloadable as a 348-page pdf.
- Detailed information and current updates regarding the *Australian ABF funding arrangements*, including AR-DRGs, SNAP, Ambulatory, Mental Health, Emergency, Teaching, and Training service categories. Also available are the latest releases of ICD-10-AM, AR-DRGs, NEP, NEC, and the outcomes of National Costing Studies – the IHACPA website is superbly laid out and gives access to a host of resources and educational material. This can be sourced at https://www.ihacpa.gov.au/service-categories
- For those interested in understanding Porter's *Value-Based Healthcare* in more detail, his 2006 book co-authored with Elizabeth Teisberg entitled *"Redefining Health Care: Creating Value-based Competition on Results"* is available from the Harvard Business School Press and can also be found online as a .PDF version.

References

1. OECD Organisation for Economic Co-operation and Development. Health at a glance 2021: OECD indicators. Paris: OECD Publishing; 2021.
2. Wikipedia. Health Economics. Wikipedia. https://en.wikipedia.org/wiki/Health_economics. Accessed 10 Sept 2022.
3. Arrow KJ. Uncertainty and the welfare economics of medical care. Am Econ Rev. 1963;53(5):941–73.
4. Parkin D, McGuire A, Yule B. Aggregate health care expenditures and national income: is health care a luxury good? J Health Econ. 1987;6(2):109–27. https://doi.org/10.1016/0167-6296(87)90002-6.
5. Narayan PK, Narayan S, Smyth R. Is health care really a luxury in OECD countries? Evidence from alternative price deflators. Appl Econ. 2011;43(25):3631–43. https://doi.org/10.1080/00036841003670788.
6. OECD Organisation for Economic Co-operation and Development. Inflation (CPI). https://data.oecd.org/price/inflation-cpi.htm. Accessed 28 Sept 2022.
7. RACMA Royal Australasian College of Medical Administrators. Digital Health Training for RACMA Members. RACMA; 2019.
8. Swensen SJ, et al. Cottage industry to postindustrial care — the revolution in health care delivery. N Engl J Med. 2010;362(5):e12. https://doi.org/10.1056/NEJMp0911199.
9. Betbeze P. Automation and the healthcare cost curve. HealthLeaders (San Francisco, Calif). 2012;15(4):36.
10. Wikipedia contributors. Luddite. Wikipedia, the free encyclopedia. https://en.wikipedia.org/w/index.php?title=Luddite&oldid=1110376746. Accessed 30 Sept 2022.
11. OECD Organisation for Economic Co-operation and Development. OECD Data. https://data.oecd.org. Accessed 16 Sept 2022.
12. 2020–25 National Health Reform Agreement [Online]. 2020. https://www.health.gov.au/initiatives-and-programs/2020-25-national-health-reform-agreement-nhra.
13. Duckett SJ. Living in the parallel universe in Australia: public Medicare and private hospitals. CMAJ. 2005;173(7):745–7. https://doi.org/10.1503/cmaj.051011.
14. Duckett SJ. Private care and public waiting. Aust Health Rev. 2005;29(1):87–93. https://doi.org/10.1071/AH050087.
15. Stephen D, Matthew C, Kristina N. Saving private health 2: making private health insurance viable. Grattan Institute, 9780648738008 0648738000, 2019.
16. Srinivasan M. From the editors' desk: hippocrates and patient-centered medicine. J Gen Intern Med. 2011;27(2):135–5. https://doi.org/10.1007/s11606-011-1948-6.
17. Codman EA. The product of a hospital. Surg Gynecol Obstet. 1914;18:491–6.
18. Fetter RB, Brand DA. DRGs: their design and development. Health Administration Press; 1991.
19. Naylor D. Humility, perspective and provocation: reflecting on Codman. J Health Serv Res Policy. 2001;6(4):249–50. https://doi.org/10.1258/1355819011927459.
20. The General Hospital Corporation. About the Codman Center. https://www.massgeneral.org/surgery/codman-center/about. Accessed 25 Sept 2022.
21. Porter ME, Teisberg EO. Redefining competition in health care. Harv Bus Rev. 2004;82(6):64–136.
22. Porter ME. What Is Value in Health Care? N Engl J Med. 2010;363(26):2477–81. https://doi.org/10.1056/NEJMp1011024.
23. Porter ME, Lee TH. The strategy that will fix health care: providers must lead the way in making value the overarching goal. Harv Bus Rev. 2013;91(10):50.
24. Lee TH, Cosgrove T. Engaging doctors in the health care revolution. Harv Bus Rev. 2014;92(6):104–38.
25. Porter ME, Kaplan RS. How to pay for health care bundled payments will finally unleash the competition that patients want. Harv Bus Rev. 2016;94(7–8):88–100.
26. Morden NE, Colla CH, Sequist TD, Rosenthal MB. Choosing wisely — the politics and economics of labeling low-value services. N Engl J Med. 2014;370(7):589–92. https://doi.org/10.1056/NEJMp1314965.
27. Chalmers K, Pearson S-A, Badgery-Parker T, Brett J, Scott IA, Elshaug AG. Measuring 21 low-value hospital procedures: claims analysis of Australian private health insurance data (2010–2014). BMJ Open. 2019;9(3):e024142–2. https://doi.org/10.1136/bmjopen-2018-024142.
28. Cliff BQ, AvanceÑA ALV, Hirth RA, Lee SYD. The impact of choosing wisely interventions on low-value medical services: a systematic review. Milbank Q. 2021;99(4):1024–58. https://doi.org/10.1111/1468-0009.12531.
29. Scott IA. Cognitive challenges to minimising low value care: cognitive bias and low value care. Intern Med J. 2017;47(9):1079–83. https://doi.org/10.1111/imj.13536.
30. Scott IA. Looking for value in health care: faced with limited resources, health care systems are obliged to identify low-value interventions that should not be funded. Med J Aust. 2012;197(10):538–9. https://doi.org/10.5694/mja12.11497.
31. Scott IA. How much end-of-life care is of low value. Intern Med J. 2018;48(10):1173–4. https://doi.org/10.1111/imj.14054.
32. Evans RG. The transformation of Australian Hospitals between the 1940s and the 1970s. Health Hist. 2005;7(2):101–25. https://doi.org/10.2307/40111614.
33. Kaiser Foundation Health Plan Inc. and Hospitals. Who we are. https://about.kaiserpermanente.org/who-we-are. Accessed 10 Sept 2022.
34. U.S. Department of Health & Human Services. Who is eligible for Medicare? https://www.hhs.gov/answers/medicare-and-medicaid/who-is-eligible-for-medicare/index.html. Accessed 22 Sept 2022.

35. Machiavelli N, Ricci L. The Prince (Il Principe. English). Project Gutenberg; 2018.
36. Fetter RB. Casemix classification systems. Aust Health Rev. 1999;22(2):16–38.
37. Rains M, Thompson T. The New Zealand casemix system. V1.2 ed. Wellington: New Zealand Casemix Project Group; 2015.
38. Raminani SR. International classification of diseases. https://www.britannica.com/topic/International-Classification-of-Diseases. Accessed 28 Oct 2022.
39. Hovenga E. Casemix and information systems, Health Informatics, vol. 27, 1996.
40. Eagar K. What is activity-based funding? ABF Information Series No. 1; 2011.
41. IHACPA. Service categories. https://www.ihacpa.gov.au/service-categories. Accessed 24 Sept 2022.
42. IHACPA. 2022. NHCDC Infographic Factsheet 330902. [Online]. https://www.ihacpa.gov.au/sites/default/files/2022-09/ihacpa60284_nhcdc_infographic_factsheet_220902.pdf.