Health care variation: time to act

Heather A Buchan[1], Anne Duggan[1,2], Jenny Hargreaves[3], Ian A Scott[4,5], Luke Slawomirski[6]

Summary

- Geographic variation in health care use has been demonstrated in many countries over many years. Such variation can be warranted — in response to patient need or preference for care — or unwarranted. Unwarranted variation raises concerns about equity and appropriateness of care.
- Recent analyses of health care provision in the *Australian atlas of healthcare variation* show that when routinely available Australian data are mapped by residence of patient, there are wide variations in rates of use of diagnostic tests, dispensing of prescriptions for a range of indications, surgical procedures and hospital admission rates.
- Despite the wealth of studies demonstrating variation in care internationally, there is relatively little research that explores the best ways of responding to unwarranted variation. Recommendations for action in the Australian Atlas focus on some approaches that could be used in Australia.

Why are knee replacement rates in Australia over four times higher than they are in Israel? Or the rate for caesarean deliveries nearly twice as high as in Finland? These findings come from an Organisation for Economic Co-operation and Development report that highlighted substantial variation in the rates of several common health care interventions both across and within 13 countries.[1] These types of geographic variations in health care use have been consistently demonstrated over long periods of time and for a vast range of clinical interventions.[2-6]

Variation in health care use across Australia has now been mapped in the recently published *Australian atlas of healthcare variation*, produced by the Australian Commission on Safety and Quality in Health Care (ACSQHC) and the National Health Performance Authority.[7] Health care use by location of patient residence is mapped using standard geographic regions. Rates are standardised by age to adjust for age differences between different geographic populations. Data used to produce the Atlas have come from three datasets: the Admitted Patient Care National Minimum Data Set (APC NMDS), covering patients admitted to public and private hospitals; the Medicare Benefits Scheme (MBS) claims database (use of medical services, procedures and tests covered under this scheme); and the Pharmaceutical Benefits Scheme (PBS) claims database (use of subsidised prescription medicines). This is the first time that data from all these datasets have been used to explore variation across health care settings.

Information on dispensing of antimicrobials, use of diagnostic investigations, interventions for chronic disease, mental health interventions (including use of psychotropic medicines), opioid dispensing and use of surgical procedures are presented in the Atlas. For most hospital admissions, the data are from the 2012–13 financial year. MBS and PBS data are for 2013–14. In Australia, there is high overall use of some drugs, such as antimicrobials and antidepressants, and considerable variation in the rates of some interventions, even when outliers are excluded (Box). Marked regional variation is apparent in rates of surgical interventions such as hysterectomy, endometrial ablation and MBS-funded cataract surgery. There are differences between states in use of psychotropic medicines. The patterns of hospital admission for chronic conditions, with higher rates in rural and regional Australia, contrast with the patterns seen for many elective surgical admissions. Some interventions are used more in areas of higher socio-economic status or, like knee arthroscopy, are known from previous work to be provided mainly in private settings.[2] There is no public/private breakdown provided in the Atlas — this would be a useful next step in order to explore the extent to which there are discrepancies in access because of people's ability or willingness to pay for health care.

Reasons for observed variation

Some variation will reflect differences in need for health care because of differing disease prevalence or severity. Studies of variation aim to account for demographic differences in disease prevalence by standardising results for age and sex. Variation in disease severity is more difficult to adjust for at the population level or to determine using routinely collected health care data. The same limitation applies to risk factors for disease.

Some observed variation may be explained by differences in patient preferences for type of care; for example, choice of medical rather than surgical treatment or for "aggressive" rather than "conservative" management.

Variation may reflect problems with datasets such as incomplete capture of information or inconsistency in coding practices. It may also be random variation — a particularly important consideration when analysing small populations.

Use of health services is clearly related to their supply and accessibility.[1,8] High intervention rates for some types of care may reflect poor access to alternatives. One reason for the marked variation in dispensing of psychotropic medicines noted in the Atlas may be a lack of access to alternative mental health care. Similarly, decreased access to community care among rural and remote populations may explain some of the higher rates of hospitalisation in these communities for chronic diseases examined in the Atlas. Less use of elective surgery may be due to lack of local service capability or the inability of patients to pay for private care. Methods for funding or reimbursing costs of health care can markedly influence service provision. Remuneration methods that reward greater volumes of procedures provide incentives to both individual health care providers and organisations for higher rates of servicing.

Clinical decisions are a key driver of health care variation. Practice patterns of individual doctors are influenced by their knowledge, skills, experiences and differences in beliefs about the benefits or harms of specific interventions.[9] Even when robust evidence on effectiveness is widely disseminated and well publicised, practices that are at variance with the evidence may remain entrenched in some areas. The personal preference of surgeons for certain types of procedures, irrespective of published literature on effectiveness, can exert a marked effect on rates of use.[10-13] Thousands of

[1]Australian Commission on Safety and Quality in Health Care, Sydney, NSW. [2]University of Newcastle, Newcastle, NSW. [3]Australian Institute of Health and Welfare, Canberra, ACT. [4]Princess Alexandra Hospital, Brisbane, QLD. [5]University of Queensland, Brisbane, QLD. [6]Organisation for Economic Co-operation and Development, Paris, France. heather.buchan@safetyandquality.gov.au ▪ doi: 10.5694/mja15.01360

Selected data items from the *Australian atlas of healthcare variation*[7]

Data item	Data source	Rate per 100 000 people*	Times difference†	Times difference† excluding outliers	No. of procedures performed/ prescriptions dispensed
Fibre optic colonoscopy	MBS	146–4374	30.0	4.1	589 748
Computed tomography of the lumbar spine	MBS	209–2464	11.8	2.7	314 033
Knee arthroscopy (people aged ≥ 55 years)	APC	185–1319	7.1	4.2	33 682
Tonsillectomy (people aged ≤ 17 years)	APC	254–1640	6.5	3.0	38 575
Hysterectomy and endometrial ablation	APC	131–687	5.2	3.3	34 181
Antidepressant medicines, prescriptions dispensed (people aged 18–64 years)	PBS	14 981–175 380	11.7	2.8	14 933 534
ADHD medicines, prescriptions dispensed (people aged ≤ 17 years)	PBS	382–28 642	75.0	7.3	544 218
Anticholinesterase medicines, prescriptions dispensed (people aged ≥ 65 years)	PBS	1843–28 261	15.3	3.7	427 211
Opioid medicines, prescriptions dispensed	PBS	10 945–110 172	10.1	2.9	13 905 258
Diabetes-related lower limb amputations (people aged ≥ 18 years)	APC	8–91	11.4	2.5	4402

ADHD = attention deficit hyperactivity disorder. APC = Admitted Patient Care National Minimum Dataset (financial year 2012–13); includes public, private and day hospital admissions. MBS = Medical Benefits Schedule (financial year 2013–14). PBS = Pharmaceutical Benefits Schedule (financial year 2013–14). * Range across local areas: rates standardised based on the age structure of the Australian population in 2001; local area refers to Australian Bureau of Statistics standard geographic region known as Statistical Area Level 3 for all items except diabetes-related lower limb amputations, which was analysed at Statistical Area Level 4 because of confidentiality requirements given the low number of admissions. † The difference in rates between the areas with the lowest and highest rates for the specific procedure/medication. ◆

Australians aged 55 and over continue to have knee arthroscopy, with markedly different rates across the country, despite evidence that arthroscopy for treatment of uncomplicated degenerative disease is no better than placebo and potentially harmful.[7,14-16] Practices known to be effective, such as foot care for people with diabetes, are not consistently employed.[17] Such variation highlights problems with the way research on effectiveness is translated into routine practice.

Variation may also result from "indication creep" when a treatment shown to be beneficial within a narrow set of indications (eg, for younger patients with severe disease and few co-morbidities) becomes used in patients with a broader set of indications (eg, for people with less severe disease or older patients with multimorbidity) where there is little or no evidence of effectiveness.

While there is general agreement about the usefulness of operations such as total knee replacement in patients with severe osteoarthritis, there are controversies in the literature about how some patient characteristics affect operative outcomes. Doctors differ in their opinions about which patients will benefit most, leading to different patient selection and different practice patterns.[13,18] While studies comparing the long term results of different treatment strategies for the same condition in "real world" patients are starting to be reported,[19] the lack of use of routine measures of patient outcome, and the risk of confounding by selection bias, mean considerable uncertainty remains about the true effects on patients of these differences in practice.

Differential use of new therapies with uncertain or unproven benefit also drives variation. The need for a system for controlled introduction and evaluation of new surgical techniques and medical technologies in Australia has been recently highlighted.[20]

Warranted versus unwarranted variation

Substantial variation in health care use that cannot be explained by patient needs or preferences is often referred to as unwarranted variation.[1] It may reflect both underuse of care of proven benefit, raising concerns about equity and the unrealised potential for better health, or overuse of care that is ineffective or likely to confer net harm, thus posing a needless threat to patients and an opportunity cost to a society with limited resources.

Identifying the rate of use of an intervention that is most appropriate within a defined patient population is a major challenge in studying warranted versus unwarranted variation. Routine data collection currently captures a large amount of information about what care is delivered in the health care system, and how long people wait to receive it, but very little about the indications for care and patient outcomes achieved as a result.

Patient-reported outcome measures are mandated for some types of surgery in the United Kingdom[21] but are not routinely used in Australia. Linkage of data from different sources to follow up patient health status (while ensuring privacy protection) is another means of determining information on outcome, but while there are some state-based systems for record linkage — for example, in Western Australia data linkage has been undertaken for several decades[22] — such linkage is not routine at the national level.

Accurate measurement of the outcomes for people who undergo common or costly interventions would help clarify which types of patients (outside of research settings) are most or least likely to benefit from care. It would also help determine the appropriate population rate of intervention use for specific clinical indications, and would allow for comparisons of variation in outcomes, in addition to variation in use, of interventions.

Defining benefit thresholds is also particularly important in avoiding the natural inclination to assume that, when confronted with a range of low or high use outliers, the mid-point or average value is necessarily the one that reflects the most appropriate rate of use.

Analysing variation

Datasets used to explore variation should satisfy certain requirements. Comprehensive population coverage provides confidence that any observed variation is not due to differential

capture of information across geographic areas. Age, sex and residence of the person receiving care are required for standardisation and mapping. The geographical regions used to report variation must have a population of sufficient size to prevent identification of individual patients and health care providers.

The three datasets used for analysis (APC NMDS, MBS, PBS) were established for administration and reimbursement purposes and currently have some limitations when used to investigate geographic variations in health care use. MBS and PBS data do not contain diagnostic information or the reason for provision of the service. Information on most public hospital drug usage, private prescribing or over-the-counter sales is not captured by the PBS data, nor is information on some medicines dispensed by Aboriginal health services. Pathology testing data are only captured on the three most expensive tests ordered for each patient and, as with medicines, information on most of the tests provided free of charge to public patients in hospitals is not captured. The APC NMDS contains detailed diagnostic and procedural information on admissions to a public or private hospital in Australia, but does not include details of tests ordered or drugs prescribed.

As a result, some types of care provided in the system are not consistently captured by any of these three datasets. For example, it is not possible to obtain an accurate picture of variation in total use of magnetic resonance imaging across public and private sectors. The lack of standardised hospital admission policy means some observed variations may be due to differences in admission practices rather than differences in care provided.

Despite their limitations, these three datasets provide the best available information in Australia for identifying variations in health care use. They could be rendered even more useful if some of the issues noted were remedied. Linking individual-level data across these datasets, and with death registries and other clinical or population datasets (while ensuring patient confidentiality), would provide better information about outcomes. It would also help highlight areas where care could be improved; for example, whether there is variation in secondary preventive care for specific conditions after discharge from hospital.

Responses to evidence of variation

The aim of publishing data showing variation in health care is to prompt investigation into why variation is occurring and to ensure that patients receive appropriate care. Reasons for variation need to be examined at a local level using information about service provision that is not available nationally and data sources such as registries that contain clinically richer collections of information about patient care delivery and its outcomes. Within the Atlas, there are 67 recommendations for action. States and local health care organisations should review data and practices in their region, particularly where they are outliers. Some findings have been referred for review by national bodies such as the Pharmaceutical Benefits Advisory Committee; for example, the use of topical quinolones and access to amoxicillin-clavulanate on the PBS. For some items, review of the need for evidence-based guidelines or for new Clinical Care Standards[23] is identified; for example, a clinical care standard for the management of osteoarthritic knee pain. Mandated adherence to the National Safety and Quality Health Service Standards[24] provides a mechanism for increasing use of evidence-based practice. The Australian Health Practitioner Regulation Agency and national boards are asked by the Commission to consider what can be done to ensure registered health professionals have up-to-date knowledge of prescribing guidelines.

Some recommendations focus on improving patients' understanding of their care options. Evidence suggests shared decision-making approaches enable people to better choose among different options with associated benefits in terms of better knowledge and more accurate expectations of the likely effects.[25,26]

Medical colleges and clinical groups may investigate and respond to the data in the Atlas in a variety of ways, including via guidelines, performance measures, audit and feedback and various behavioural incentives.[27]

Researchers have documented large and persistent variations in health care use, far beyond that explainable by patient need or preference, for many decades.[28,29] Research into causes and consequences of variation has been less prolific and linking research to action on unwarranted variation has been problematic. The involvement of policy agencies and clinical organisations in the generation and use of the Australian Atlas offers the opportunity to link investigation of variation with policy levers and actions by health care organisations and clinical groups to reduce unwarranted variation.

Acknowledgements: The National Health Performance Authority conducted the analyses for the *Australian atlas of healthcare variation*.

Competing interests: Heather Buchan is employed by the ACSQHC. Anne Duggan chaired the Atlas Advisory Group for the ACSQHC. Jenny Hargreaves and Ian Scott were members of the Atlas Advisory Group for the ACSQHC. Luke Slawomirski was previously employed by the ACSQHC. The contents of this article are solely the views of the authors.

Provenance: Commissioned; externally peer reviewed. ■

1 Organisation for Economic Cooperation and Development. Geographic variations in health care. what do we know and what can be done to improve health system performance? OECD health policy studies. Paris: OECD Publishing; 2014.

2 Australian Commission on Safety and Quality in Health Care and Australian Institute of Health and Welfare. Exploring healthcare variation in Australia: analyses resulting from an OECD study. Sydney: ACSQHC, 2014.

3 Corallo AN, Croxford R, Goodman DC, et al. A systematic review of medical practice variation in OECD countries. *Health Policy* 2014; 114: 5-14.

4 The Dartmouth Atlas Working Group. The Dartmouth atlas of health care. http://www.dartmouthatlas.org (accessed Feb 2016).

5 Public Health England. Atlases of variation in health and health care. http://fingertips.phe.org.uk/profile/atlas-of-variation (accessed Nov 2016).

6 Alderwick H, Robertson R, Appleby J, et al. Better value in the NHS: the role of changes in clinical practice. London: The King's Fund; 2015.

7 Australian Commission on Safety and Quality in Health Care, National Health Performance Authority. Australian atlas of healthcare variation. Sydney: ACSQHC; 2015.

8 Fisher ES, Wennberg JE, Stukel TA, et al. Associations among hospital capacity, utilization, and mortality of US Medicare beneficiaries, controlling for sociodemographic factors. *Health Serv Res* 2000; 34: 1351-1362.

9 Garner S, Littlejohns P. Disinvestment from low value clinical interventions: NICEly done? *BMJ* 2011; 343: d4519.

10 Bederman SS, Coyte PC, Kreder HJ, et al. Who's in the driver's seat? The influence of patient and physician enthusiasm on regional variation in degenerative lumbar spinal surgery: a population-based study. *Spine (Phila PA 1976)* 2011; 36: 481-489.

11 Birkmeyer JD, Reames BN, McCulloch P, et al. Understanding of regional variation in the use of surgery. *Lancet* 2013; 382: 1121-1129.

12 Weinstein JN, Bronner KK, Morgan TS, Wennberg JE. Trends and geographic variations in major surgery for degenerative diseases of the hip, knee, and spine. *Health Aff (Millward)* 2004; Suppl Variation: VAR81-VAR89.

13 Wright JG, Hawker GA, Bombardier C, et al. Physician enthusiasm as an explanation for area variation in the utilization of knee replacement surgery. *Med Care* 1999; 37: 946-956.

14 Buchbinder R, Harris IA. Arthroscopy to treat osteoarthritis of the knee? *Med J Aust* 2012; 197: 364-365. https://www.mja.com.au/journal/2012/197/7/arthroscopy-treat-osteoarthritis-knee

15 Carr A. Arthroscopic surgery for degenerative knee: overused, ineffective, and potentially harmful. *Br J Sports Med* 2015; 49: 1223-1224.

16 Thorlund JB, Juhl CB, Roos EM, Lohmander LS. Arthroscopic surgery for degenerative knee: systematic review and meta-analysis of benefits and harms. *BMJ* 2015; 350: h2747.

17 Bergin SM, Alford JB, Allard BP, et al. A limb lost every 3 hours: can Australia reduce amputations in people with diabetes? *Med J Aust* 2012; 197: 197-198.

18 Toronto Arthroplasty Research Group Writing Committee, Wright JG, Hawker GA, Hudak PL, et al. Variability in physician opinions about the indications for knee arthroplasty. *J Arthroplasty* 2011; 26: 569-575.

19 Sedlis SP, Hartigan PM, Teo KK, et al. Effect of PCI on long-term survival in patients with stable ischemic heart disease. *N Engl J Med* 2015; 373: 1937-1946.

20 Maddern GJ. New surgical technology: do we know what we are doing? *Med J Aust* 2015; 202: 400-401.

21 NHS Digital. Patient reported outcome measures (PROMs). http://www.hscic.gov.uk/proms (accessed Feb 2016).

22 Holman CDAJ, Bass JA, Rosman DL, et al. A decade of data linkage in Western Australia: strategic design, applications and benefits of the WA data linkage system. *Aust Health Rev* 2008; 32: 766-777.

23 Australian Commission on Safety and Quality in Health Care. Clinical care standards. http://www.safetyandquality.gov.au/our-work/clinical-care-standards (accessed Feb 2016).

24 Australian Commission on Safety and Quality in Health Care. Accreditation and the NSQHS standards. http://www.safetyandquality.gov.au/our-work/accreditation-and-the-nsqhs-standards (accessed Oct 2016).

25 Hoffmann TC, Légaré F, Simmons MB, et al. Shared decision making: what do clinicians need to know and why should they bother? *Med J Aust* 2014; 201: 35-39. https://www.mja.com.au/journal/2014/201/1/shared-decision-making-what-do-clinicians-need-know-and-why-should-they-bother

26 Stacey D, Légaré F, Col NF, et al. Decision aids for people facing health treatment or screening decisions. *Cochrane Database Syst Rev* 2014; 9: CD006732.

27 Emanuel EJ, Ubel PA, Kessler JB, et al. Using behavioral economics to design physician incentives that deliver high-value care. *Ann Intern Med* 2016; 164: 114-119.

28 Appleby J, Raleigh V, Frosini F, et al. Variations in health care: the good, the bad and the inexplicable. London: The King's Fund, 2011.

29 Wennberg JE. Forty years of unwarranted variation — and still counting. *Health Policy* 2014; 114: 1-2. ■