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Time to tackle unwarranted variations in practice

Much of the variation in use of healthcare is accounted for by the willingness and ability of doctors to offer treatment rather than differences in illness or patient preference. Identifying and reducing such variation should be a priority for providers, says **John Wennberg**

Since Alison Glover's classic 1938 study showing local differences in rates of tonsillectomy among British schoolchildren,[1] health service researchers have documented extensive variation in the delivery of healthcare in many parts of the world.[2-5] Information on practice variation is important for examining the relations between policy decisions and clinical decisions and raises important questions concerning the efficiency and effectiveness of healthcare. I have therefore argued that population based information should be routinely reported[6] and, through the Dartmouth Atlas Project, have taken steps to make such information publicly available for care to Americans aged ≥65 years provided through the Medicare programme. The project has highlighted that much of the variation among hospital referral regions in per capita spending, resource allocation, and service use is unwarranted because it isn't explained by illness or patient preference.[7 8]

The publication of *The NHS Atlas of Variation in Healthcare*,[9] which compares healthcare delivery among primary care trusts, shows a similar story in England. Below, I consider the relevance of the Dartmouth work for the NHS.

PAUL BOSTON

The key question is whether more is better; is greater care intensity associated with better health outcomes?
Is healthcare being inappropriately rationed in low rate regions or overused in high rate regions?

Unwarranted variation and categories of care

In evaluating practice variation, clinical care can be grouped into three categories with different implications for patients, clinicians, and policy makers[10]:

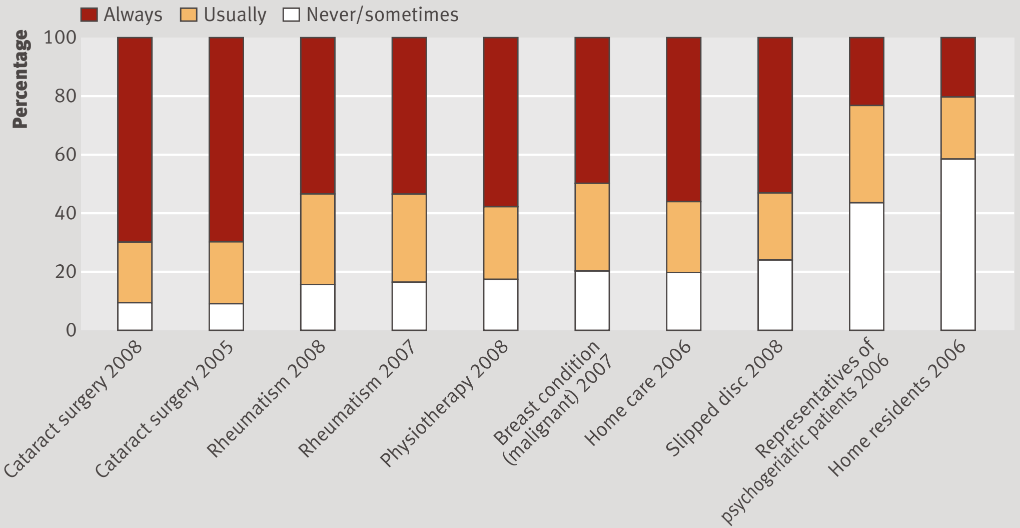
- *Effective care* is defined as interventions for which the benefits far outweigh the risks; in this case the "right" rate of treatment is 100% of patients defined by evidence based guidelines to be in need, and unwarranted variation is generally a matter of underuse.
- *Preference sensitive care* is when more than one generally accepted treatment option is available, such as elective surgery; here, the right rate should depend on informed patient choice, but treatment rates can vary extensively because of differences in professional opinion.
- *Supply sensitive care* comprises clinical activities such as doctor visits, diagnostic tests, and hospital admissions, for which the frequency of use relates to the capacity of the local healthcare system. Among older Americans, most of these services are used in caring for chronic illness. However, regions with high rates of use of supply sensitive care do not have better overall outcomes as measured by mortality and indicators of the quality of care, suggesting that the problem in the US is overuse of this category of care.

Effective care

The Dartmouth atlas and the NHS atlas each report examples of substantial underuse of

COMMENTARY

The Dutch approach to unwarranted medical practice variation



Percentage of care users who reported that they were involved in decisions about care and treatment, 2005-8[4]

Medical practice varies considerably, both within and between countries. Rates of surgical procedures and medical treatment seem to be unrelated to illness and other patient related factors in many studies.[1] Wennberg makes the intriguing observation that supply is the prime determinant of healthcare usage in the United States: most unwarranted healthcare is given in areas with high supply levels and does not result in improved patient outcomes.[1]

Wennberg defines three categories of care: effective care, preference sensitive care, and supply sensitive care, with supply factors relating to overuse in the last two categories. Supply levels in the Netherlands vary less than in the US. This is because healthcare supply in the Netherlands was—at least until 2006—centrally planned and controlled by the government. You might therefore expect that variations in delivery of healthcare would be insignificant. Unfortunately, this is not the case. The 2010 Dutch healthcare performance report notes remarkable variations in quality and price of healthcare between care providers.[2] For instance, the percentage of unplanned caesarean sections carried out in low risk pregnancies varied from 7.3% to 30.2% across hospitals. This variation is unwarranted because it is to a large extent unrelated to patient based factors.

In preference sensitive care there is scientific uncertainty about the best option for effective treatment in terms of mortality or quality of life; at least two equipoise treatment options exist.[1] In these cases the decision is theoretically shared between the patient and doctor. However, most patients still leave the decision to

effective care. Although there is widespread agreement that unvaccinated patients with pneumonia benefit from pneumococcal vaccinations, in some US regions less than 45% of Medicare patients were vaccinated, while in others the figure was over 95%.[7] Among primary care trusts, there is more than a fivefold variation in the percentage of diabetic patients receiving nine care processes recommended by the National Institute for Health and Clinical Excellence.[9]

In the US, underuse of effective care cannot be attributed to lack of resources. Dartmouth atlas studies show that spending more per capita, having more physicians, and producing more hospital admissions (and having a strong national reputation as a high quality academic medical centre) isn't associated with providing more effective care.[11-13] So what is associated with this variation in performance? Not surprisingly, the degree to which care is organised and coordinated seems to matter: there is less underuse in regions served by organisations such as the Mayo Clinic or Intermountain Healthcare, where specialists, primary care doctors, and others practise "team medicine." There is also less underuse in regions where care may be easier to coordinate: those that have fewer doctors managing the care of chronically ill patients and have more primary care doctors relative to the number of specialists.[8]

Preference sensitive care

Both the US and the English data show extensive variation in elective surgery rates—variation that is much greater than can reasonably be explained by illness. For example, among Americans aged ≥65 years, age, sex, and race adjusted rates of arthritic knee replacement varied by a factor of 4.7, hip replacement by 5.3, and mastectomy for breast cancer by 7.3. The variation among English primary care trusts for knee and hip replacement is lower but is still more than twofold. Spending on hysterectomy shows a fourfold variation among primary care trusts.

It is important to remember that patients in regions with low elective surgery rates are not necessarily going untreated—often, they are being treated differently. Some patients with arthritis of the knee or hip get non-surgical treatments or try lifestyle modifications. Patients with early stage breast cancer are sometimes treated with lumpectomy. Women with abnormal uterine bleeding may have less invasive procedures than hysterectomy. Although patients should choose their treatment, in everyday practice they delegate decision making to physicians, and the decision is therefore strongly influenced by local medical opinion.

Attempts to reduce elective surgery in high rate areas by setting budgets may therefore be unsuccessful as they will not tackle the flaws in clinical decision making that are behind much of the variation. And adherence to evidence-based practice guidelines, as important as these may be, won't match patients to their preferred treatment. In a study in Ontario, Canada, only 15% of patients who met the clinical guidelines for hip or knee arthroplasty (based on symptom level and radiological changes) actually wanted surgery when asked which treatment they preferred.[14] Treating patients according to their preferences—and not giving them treatments they do not want—requires a clinical environment that supports shared decision making and encourages the active engagement of patients in the choice of treatment. How can we achieve this?

Clinical trials show that patient decision aids can improve the quality of clinical decision the doctor. As a consequence, the supplier dominates.

Shared decision making in preference sensitive care is still a novelty in the international healthcare sector. Recent Consumer Quality Index questionnaire data on experiences of Dutch hospital patients shed some light on this.[3] [4] Only 50% of patients with a malignant breast condition (n=393) or spinal disc herniation (n=1521) reported that they were fully involved in decision making about treatment and care in a survey conducted by the independent non-profit organisation, Consumer Experience Centre (CKZ).[4] A fifth of patients said they were "never/sometimes" involved (figure). An enormous challenge here is to enhance the patient's role in determining the use of preference sensitive care. Variation in these cases is unwarranted if it is predominantly doctor driven and not related to patients' preferences.

Since the introduction of managed competition into the Dutch health system in 2006,[5] the volume and fees of elective surgery are set by free negotiation between health insurers and providers. As might be expected, given the fact that shared decision making is still a novelty, the volume of preference sensitive care went up rapidly and regional variation increased. The number of cataract procedures, for example, increased by roughly 25% between 2005 and 2010.[6] Furthermore, in areas with centres that specialised in certain procedures, the rates of those procedures were much higher than in other areas.[7] Apparently the indication for a surgical procedure varies substantially across hospitals. Since the Dutch prefer to get their care nearby, geography seems to matter: what you get depends on where you live. Similar results were observed for prostatectomies and tonsillectomies.

The final category Wennberg mentioned is supply sensitive care—everyday care used by people with acute and chronic conditions (physician visits, referrals, prescription of drugs, tests, etc). In general the more this is supplied and easy accessible, the more that is consumed. Wennberg states that more of this care is in most cases not related to better outcomes. Primary care providers largely determine the frequency of such care. In the Netherlands, where general practitioners act as the gatekeeper of the healthcare system, bundled payment was recently introduced for chronic diseases—for example, diabetes, chronic obstructive pulmonary disease, and management of cardiovascular risk.[8] Under this system insurers pay a single fee to a newly created contracting entity—the "care group"—to cover a full range of care for a fixed period. The care provided is defined by national guidelines. General practitioners have taken a central position in the care groups. The new system is to bring down unwarranted variation and fragmentation of care. Early signs show that the delivery of diabetes care has improved as a result of the enhanced coordination of care, but it is too soon to see differences in outcomes (such as avoidable hospital admissions).

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1 Wennberg JE. Tracking medicine: a researcher's quest to understand health care. Oxford University Press, 2010.
2 Westert GP, van den Berg MJ, Zwakhals SLN, Heijink R, de Jong JD, Verkleij H. Dutch health care performance report 2010. National Institute for Public Health and the Environment, 2010. www.healthcareperformance.nl.
3 Stubbe JH, Brouwer W, Delnoij DM. Patients' experiences with quality of hospital care: the consumer quality index cataract questionnaire. *BMC Ophthalmol* 2007;7:14.
4 Centrum Klantervaring Zorg, NIVEL. Jaarrapportage klantervaringen in de zorg 2009 [customer experience in healthcare annual report]. Utrecht: CKZ/NIVEL, 2010.
5 Westert GP, Burgers J, Verkleij H. The Netherlands: regulated competition behind the dykes? *BMJ* 2009;339:b3397.
6 Dutch Healthcare Authority. Monitor medisch specialistische zorg 2010 [Monitor medical specialist care 2010]. NZA, 2010.
7 Plexus. To reduce practice variation [Dutch]. Ministerie van Volksgezondheid en Sport, 2010.
8 Struijs JN, Baan C. Integrating care through bundled payments—lessons from the Netherlands. *N Engl J Med* 2011;364:990-1.

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making, resulting in more knowledgeable patients and treatment decisions more in keeping with the patient's underlying preferences. Moreover, the use of decision aids seems to decrease the demand for invasive treatments, suggesting that the "right" rate—a rate based on informed patient choice—may be lower than the rate achieved when doctors determine the treatment without the patient's active participation.[15] In an era of tightened budgets and increasing concerns over healthcare rationing, this is good news.

Public support for shared decision making seems to be growing in the UK and the US. It has a key role in the coalition government's health reform policy[16] and is supported in the recent Patient Protection and Affordable Care Act in the US. Broad international support for shared decision making seems also to be growing, as shown at a recent seminar sponsored by the Salzburg Global Seminar.[17]

Supply sensitive care

Supply sensitive care describes a group of services that are directly related to the supply of physicians, healthcare facilities, and medical equipment. In the US, per capita frequency of use of this kind of care varies strikingly, and most of it is used to manage chronic illness.[8] For example, during the last six months of life, the number of physician visits per patient aged ≥65 varied nearly fivefold among regions, from 12.6 to 60.2 visits. The intensity of inpatient care also varied extensively: the proportion of chronically ill patients who had been admitted to an intensive care unit at the time of death ranged from 31.1% to 4.2% (2007 data). In the NHS emergency hospital admissions for elderly people (≥76 years) vary more than twofold, as do admissions for cancer and chronic pulmonary obstructive disease; the percentage of deaths that occur in hospital ranges from 44% to 76%.

There are good reasons for reducing unwarranted variation in supply sensitive care. In the US, it accounts for most of the twofold regional variation in total per capita spending on patients aged ≥65. Understanding why some US regions have more resources (hospital beds, physicians, imaging machines, etc) per capita, and thus spend more on healthcare, requires local knowledge about the dynamics of growth and the incentives inherent in fee for service medicine. The key question, however, is whether more is better; is greater care intensity associated with better health outcomes? Is healthcare being inappropriately rationed in low rate regions or overused in high rate regions?

Unfortunately, patient level clinical research provides little help in answering this question: it is silent on the optimum frequencies of use of supply sensitive care for chronic conditions. Why, then, do I believe that the evidence points to overuse in the US—that more care isn't better? The evidence comes from studies of outcomes for patients admitted to hospital for hip fractures, heart attacks, and colon cancer.[18] Those living in regions with a high intensity pattern of care—who, by virtue of where they are treated, receive more visits, imaging examinations, and admissions—have worse or no better survival than those living in low intensity regions.[8] A similar pattern is seen among those who receive their care in academic medical centres.[19]

While the implications of greater intensity of care are obvious for cost, the evidence for added value in the US is conspicuously absent. Of course, the UK, which has a lower level of resource investment, may not show similar results. But the most important challenge to the clinical and research communities on both sides of the Atlantic is to rationalise the clinical pathways for managing chronic disease: to undertake the clinical research required to convert the "black box" of supply sensitive care into evidence based care that is effective or preference sensitive. This means that the focus of improvement must be on care provided over time (throughout the course of a chronic illness, not just terminal care); it must include all important chronic conditions, not just selected ones, and integrate care among all sectors (community care, inpatient care, extended care, nursing home care, and hospice care). In short, reform requires the integration of primary and specialty care into organised systems capable of coordinating care; rationalising the clinical pathways for managing the population of those with chronic illnesses; and adjusting capacity to reflect the requirements for efficient use of resources.

The advantages to patients as well as the US economy are evident. If the whole of the US followed the practice patterns of high quality, low cost regions served by organised systems such as Mayo Clinic and Intermountain Healthcare, Dartmouth atlas benchmarks suggest it would save 40% of resources spent on chronic illness.[20] I suspect that coordination of primary and specialty care would also result in appreciable savings in England.

Putting knowledge into practice

Although research into practice variation has improved our understanding of the nature of unwarranted variations and how they may be reduced, this knowledge has had only modest effects. As the editors of the NHS atlas, Muir Gray and Philip DaSilva, state: "To generate widespread change, the need to identify and reduce unwarranted variation must be placed at the centre of commissioning decision-making, and also needs to be a priority for clinicians and patients." At a time of shrinking budgets, rising concern over the cost and value of healthcare, and widespread consensus that healthcare must be reformed, motivation to take the painful steps required to change healthcare has never been greater.

The NHS atlas shows how the public sector can ensure the availability of data for monitoring practice variation. In the US and other western nations, access to such data currently depends on the initiatives of researchers, the support of funding agencies, and the willingness of insurers and others to share their data. My hope is that other countries will emulate the NHS example and work together to build an international framework for evaluating heath system performance.

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1 Glover JA. The incidence of tonsillectomy in school children. *Proc R Soc Med* 1938;31:1219-36. (Reprinted in: *Int J Epidemiol* 2008;37:9-19.)
2 Paul-Shaheen P, Clark JD, Williams D. Small area analysis, a review and analysis of the North American literature. *J Health Polit Policy Law* 1987;12:741-809.
3 McPherson K, Wennberg JE, Hovind OB, Clifford P. Small-area variations in the use of common surgical procedures: an international comparison of New England, England and Norway. *N Engl J Med* 1982;307:1310-4.
4 Swart E, Deh U, Robra BP. Using claims data for small area analysis and controlling of hospital care. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 2008;51:1183-92.
5 Busato A, Kunzi B. Primary care physician supply and other key determinants of health care utilisation: the case of Switzerland. *BMC Health Serv Res* 2008;8:8.
6 Wennberg J, Gittelsohn A. Small area variations in health care delivery: a population-based health information system can guide planning and regulatory decision-making. *Science* 1973;182:1102-8.
7 Dartmouth Atlas of Health Care. www.dartmouthatlas.org/.
8 Wennberg JE. Tracking medicine: a researcher's quest to understand health care. 2010.
9 QIPP/Right Care. The NHS atlas of variation in healthcare. 2010. www.rightcare.nhs.uk/atlas/.
10 Wennberg JE, Fisher ES, Skinner JS. Geography and the debate over Medicare reform. *Health Aff* 2002;(suppl web exclusives):w96-114.
11 Baicker K, Chandra A, Skinner JS, Wennberg JE. Who you are and where you live: how race and geography affect the treatment of Medicare beneficiaries. *Health Aff(Millwood)* 2004;(suppl, web exclusives):var33-44.
12 Baicker K, Chandra A. Medicare spending, the physician workforce, and beneficiaries' quality of care. *Health Affairs* 2004;23:w184-97.
13 Wennberg, JE, Fisher, ES, Goodman, DC, Skinner, JS. *Tracking the care of patients with severe chronic illness: the Dartmouth Atlas Of Health Care 2008*. www.dartmouthatlas.org/downloads/atlases/2008_Chronic_Care_Atlas.pdf.
14 Hawker GA, Wright JG, Coyte PC, Williams JI, Harvey B, Glazier R, et al. Determining the need for hip and knee arthroplasty: the role of clinical severity and patients' preferences. *Med Care* 2001;39:206-16.
15 O'Connor AM, Bennett CL, Stacey D, Barry M, Col NF, Eden KB, et al. Decision aids for people facing health treatment or screening decisions. *Cochrane Database Syst Rev* 2009;3:CD001431.
16 Department of Health. Equity and excellence: liberating the NHS. 2010 www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_117353.
17 Salzburg Global Seminar. The greatest untapped resource in healthcare? Informing and involving patients in decisions about their medical care, 12-17 December, 2010. www.salzburgglobal.org/2009/sessions.cfm?nav=home&IDSPECIAL_EVENT=2754.
18 Fisher ES, Wennberg DE, Stukel TA, Gottlieb DJ, Lucas FL, Pinder E. The implications of regional variations in Medicare spending. Part 2: health outcomes and satisfaction with care. *Ann Intern Med* 2003;138:288-98.
19 Fisher ES, Wennberg DE, Stukel TA, Gottlieb DJ. Variations in the longitudinal efficiency of academic medical centers. *Health Aff(Milwood)* 2004;(suppl web exclusives):var19-32.
20 Wennberg, JE. Tracking medicine: a researcher's quest to understand health care. Oxford University Press, 2010:185-6.

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A review of John E Wennberg's book *Tracking Medicine* is on p 711, and the Dartmouth atlas is the subject of this week's Medical Classic (p 713).

See also EDITORIALS, p 665, and FEATURES, p 682

FROM BMJ BLOGS

Ryuki Kassai from Fukushima: the first week of the disaster

It is now seven days since the first earthquake and tsunami hit us in the Pacific coast areas of the Tohoku region. In the Fukushima prefecture, where I am, at least 602 people were killed, 3844 are missing, and 45 826 people were compelled to live in 426 evacuation shelters. We still do not know the exact numbers of casualties, because the damage is enormous.

The first two days were hectic. Essential services such as water, gas, electricity, and phone networks were not working. Normally I move between five teaching practices, but I had to cancel these visits because the transportation systems and the roads were badly damaged. I tried hard to make sure that all my trainees and colleagues were safe and sound. However, I was not able to contact them all until five days after the first earthquake hit. Fortunately, they are all safe, and we have been able to talk to each other by using our internet network. I have also been part of the anti-disaster team at Fukushima Medical University in Fukushima city. Patients with major trauma and those in medical and surgical emergencies were brought by helicopters to the university hospital, the largest teaching hospital in the prefecture. The hospital itself has been functioning well, collaborating with the prefectural government headquarters and the disaster medical assistance teams that have come from several other prefectures not affected by the disaster. A major lesson from this period was the need to resume information networks as quickly as possible.

After the earthquakes and tsunami we had to face the third disaster—the series of hazardous accidents at the nuclear power plants on the coast in Fukushima prefecture. Even though the Fukushima Medical University hospital has well trained, dedicated specialists in nuclear medicine who had prepared for potential nuclear incidents and who could provide us with information, there was much anxiety among the care teams and among patients and their families that swelled like a cascade after rain.

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