**UNIT 6: Information Aggregation**

Overview: Understand analysis of clinical variation to identify potential sources of waste.

6A: Focuses on concerns about waste in healthcare that arise when quantity (spending) and quality (health benefits) of healthcare do not seem to positively correlate.

6B: Reviews both the approach of and the major concerns with the Dartmouth Atlas project as an initiative to identify waste. I highlight the concern that health spending may be driven by provider incentives or preferences, independent of patient preferences or health needs. Finally, I note the difficulty with truly isolating provider-driven waste and advocate addressing issues of variation in care by decomposing the many considerations and actions that cumulate to determine treatment choice.

Learning Objectives:

1. Be aware of the general focus on wasted (duplicate or unnecessary) spending in healthcare and of the Dartmouth Atlas approach.
2. Learn to think critically about sources of variation in care. Recognize that not all regional (or other) variation represents waste.
3. The key learning objective of this unit is that it is useful to decompose underlying sources of geographic (or other) variation in care to isolate what specific, underlying factor(s) are driving variation

Note that this unit has many specific examples, illustrating (just some of) the many factors contributing to variation in care across geographies or other entities. I recommend that you *do not* worry about memorizing each specific example; the overall perspective is what matters.

Role in Course: This unit represents the beginning of course Section 2, focusing on the creation of *information* to support value-based care by evaluating providers’ contributions (positive or negative) to value in healthcare and by assessing treatment options. Our discussion of incentives illustrated payers need to understand the benefits of various medical treatments to do a good job of setting and evaluating provider incentives. In shifting to a focus on information in Section 2, I am also shifting from discussion of a payer role to discussion of a policy maker role (noting that many different organizations, including payers, may choose to fill this role).

**Information Aggregation: Searching for Waste**

One common approach to value-based care is to analyze clinical variation to identify potential sources of wasted spending in health care. We generally need a large amount of data to fully understand the patterns and implications of variation in treatment mixes across provider and geography, so this is an information aggregation problem. The simple, and intuitive, idea here is that if expensive treatments are offered in some settings but not others, and if those treatments are not associated with better outcomes, it suggests they can be eliminated. This is the most politically feasible way to reduce healthcare spending.

**Waste: Estimates and Examples**

In general, we often assume that waste is present when the quantity and quality of care do not seem to correlate. One important reason for the failure of quantity to drive quality is if services are unnecessary and hence of no or even negative benefit.

The U.S. Institute of Medicine (IOM) in 2013 estimated categories of waste as the following:

* Unnecessary clinical services or medical interventions (including tests, treatments, pharmaceuticals, etc.) that are not evidence-based (not considered beneficial according to the most current clinical guidelines). The IOM estimates this category as $210 billion in annual waste in the US.
* Excessive administrative costs, largely due to multiple, varied insurance systems. US estimate: $190 billion annually.
* Inefficient care due to system redundancies or coordination failures (this includes medical errors and preventable complications). US estimate: $130 billion annually.
* Prices judged to be excessively high. US estimate: $105 billion annually.
* Fraud. US estimate: $75 billion annually.
* Missed prevention opportunities. US estimate $55 billion annually.

The IOM list above helps illustrate how waste in healthcare spending creates many, varied opportunities for the addition of value through Health IT, e.g., through decision support providing evidence-based guidelines at all levels of care, through patient records that are accessible across fragmented teams, through automation in tracking and billing, and even through forensic accounting rooting out fraud. (Note that it is probably not important to memorize the above list. Instead, the list is provided to give you a somewhat more concrete sense of what policymakers and others often mean when they address issues around wasted healthcare spending.)

Many articles also address waste; below is a small sample:

* A 1938 *Proceedings of the Royal Society of Medicine* study (by Glover) found a three-fold difference in childhood tonsillectomy procedure rates across regions in Oxford and Cambridge, England. Further evidence suggested that the difference in procedures seemed to be driven by school health officer preferences, as they were the referral sources for this care.
* More recently a 2005 study in *Health Affairs* in 2004 (by Baicker & Chandra) considers the relationship between spending and specific measures of care quality in Medicare data. Looking across US states, they find a correlation between higher spending and *lower* assessed quality of care. Considering the time series, they find the same inverse relationship between changes in spending and changes in care quality (spending increases are associated with quality decreases). The authors argue the driving mechanism might be the provider mix in a geographic area. They find that a lower proportion of general practitioners (versus specialists) is associated with higher spending and lower quality.
* In the popular press, a 2009 New Yorker article (by Gawande) made some of these issues come to life by focusing on a small town in Texas that was described as the most expensive town for healthcare in the world, and where reporting suggested a provider culture of overuse, if not fraud.

**Dartmouth Atlas Methodology**

*Promise*. The Dartmouth Atlas ([www.dartmouthatlas.org)](http://www.dartmouthatlas.org)) is arguably the most notable effort at pinpointing waste in medical expenditures (see work by Wennberg including his initial 1973 *Science* article). This effort primarily uses Medicare claims data to correlate health spending and quality across regions of the US. The Dartmouth Atlas team has had a huge impact on health policy discussions, most often by pointing to what they term as **supply-sensitive care.** They typically define supply-sensitive care as interventions for which usage frequency is driven by characteristics of the local healthcare system rather than being driven by application of clear evidence-based guidelines or by specific patient preferences. Evidence of purely supply-sensitive care is often equated to evidence of overutilization of healthcare and hence waste.

*Criticisms*. Many of the main criticisms of the Dartmouth Atlas approach are reviewed in Rosenbaum *New England Journal of Medicine* 2017. These include:

* In many cases the Dartmouth Atlas contains **only Medicare spending**, but aspires to make broad conclusions about healthcare spending and quality across the entire population. It is debatable whether Medicare spending is a proxy for total healthcare spending, and in fact some providers might cost-shift between Medicare and non-Medicare spending (so lowered costs to Medicare simply mean higher costs to other payers and do *not* mean lower healthcare spending overall).
* The US economy itself is both vast and variable, with major **cost of living** differences across location. These cost differences include aspects of provider costs.
* Variation in spending may reflect **under-treatment** in cheaper locations rather than overtreatment in more expensive. Assuming all variation is equivalent to waste essentially assumes that the ideal amount of care is also the lowest amount we see. At a more micro level, some providers (or hospitals) might perform a large number of specific procedures because they are very expert at doing so.
* To tie variations in spending to waste, we have to estimate the benefits of care. This brings up the major challenges regarding **risk adjustment**; if a particular sub-population is at greater risk, we might expect to spend more on that population for worse overall results even with perfect value-based care. For example, a patient who doesn’t adhere as well to recommended drug regimens might both need additional (expensive) physician visits and also end up with poorer health outcomes. Given that adherence often goes un-measured, this hidden effect could create an impression that higher spending causes lower benefits. (Note that not all aspects of risk implicate the patient’s behavior, e.g., genetics, uncontrollable environment, etc. may also matter.). Some Dartmouth studies have focused on the last 6 months of life, arguing that mitigates some need for risk adjustment, given that presumably patients are all quite sick at the end of life. However, this approach can be criticized, particularly given that we do know sometimes lower quality care is associated with faster mortality.
* Note, finally, that Rosenbaum makes an interesting point that a tempting **narrative** is that we can cut spending by rooting out unnecessary care, thereby maintaining benefits at lower costs. So, there is some reason to believe that if we don’t think carefully about the underlying mechanisms driving variation, we’ll just simply assume that variation points to overutilization… because we want to!

**Classification of Variation in Care: Disentangling Waste from Alternative Variation**

If we are looking for waste, variation in aggregate spending is a place to start, but we must try to classify the variation we see.

* **Desirable** **variation in care** (or at least understandable variation in care) is driven by variation across geography in health-related needs. It is perfectly reasonable to expect that care will look different across geographies because factors related to both health and economics vary across geographies. For instance:
  + Costs of living (e.g., wages, building and other overhead costs, etc.)
  + Underlying patient clinical need (e.g., need for maternity care varies with age distribution of women, etc.).
  + Health-related patient risk factors (e.g., levels of activity, adherence to physician recommendations, etc.)
  + Patient preferences (e.g., some populations may have a greater understanding of and preference for diagnostic testing, etc.).
* So, what we need to do if we want to understand waste is to isolate sources of **undesirable (or unwarranted) variation** in care. Wasted care involves interventions a rational patient would have prospectively rejected given a better understanding of the expected benefits versus the harms and risks of treatment. (I say the patient would have prospectively rejected this care to distinguish between prospectively unneeded care and bad luck in care outcomes.). These include:
  + **Duplication of services**, or needed care provided in a redundant fashion (e.g., tests that are repeated solely because physicians do not have shared access to medical records).
  + **Unnecessary services**, or interventions with either zero or negative expected impact on the patient’s health.
* Finally, we should always keep in mind that variation might actually reflect **underutilization** in areas with less care. This variation is undesirable but reflects lack of access rather than wasted spending on care.

Note, finally, that not all beneficial care can or should be funded by all health systems. However, when care is necessary and beneficial, but not currently cost-effective, we would not deem it to be waste. Stated differently, health care systems often cannot fund even all necessary, non-duplicate services given budget constraints.

**Methodology: Journey to Care**

The main message I want to convey regarding geographic (or other) variation in spending is that it is useful to look as specifically as possible at all of the possible drivers of care in a particular treatment category or clinical episode. It’s not enough to document variation; if we want to make good conclusions, we have to unpack the specific mechanisms driving variation.

Birkmeyer et al. (2013 *Lancet*) illustrate this approach for variations in surgical care, taking a patient perspective on the entire pathway through diagnosis and care, and looking for decision points at each stage where variation can arise. (The basic logic of their approach could be applied to any form of care.). For instance, all of the following can vary with geography[[1]](#footnote-1):

* True, underlying disease incidence
* Frequency of disease detection (e.g., screening rates, interpretation of test results)
* Patient willingness to follow up with suggested care and/or consent to treatment
* Degree to which clinicians incorporate patient preferences into decisions
* Variation in clinical judgment in situations where the state-of-the-art clinical evidence base contains many grey areas (e.g., in terms of assessing patient characteristics or in terms of how these patient characteristics map to advice about care)

Rate and amount of the diffusion of new knowledge and technologies

* Physician training (e.g., differences in the ability to execute various treatments, differences in physician understanding of and enthusiasm for different treatments)
* Financial incentives to providers
* Regional intensity of supply
  + Note that supply might follow patient need (or other factors)
  + Also note that, in some cases, the demand from legitimately, clinically eligible patients outpaces the supply of physicians able to perform a treatment. In this case, increases in treatment with supply would suggest a reduction in underutilization.

Overall, then, if you think about a patient’s journey to surgery, it is likely to be influenced by true underlying disease state, by processes of diagnosis and testing, by patient preferences and the weight these preferences are given. It is also likely to be influenced by the rate of diffusion of new technologies and by physician training. All of these factors can contribute to or even obscure variation due to financial incentives or supply of providers in an area. Only these last two factors (financial incentives and provider supply) drive undesirable, supply-sensitive care.

If you want to understand variation in treatments, it’s important to see at what step, or steps, along the patient’s journey, variation is created. Once these specific sources of variation are identified, one can assess clinical care against the evidence base to see if variation reflects desirable or undesirable sources (and whether undesirable variation reflects over- or under-utilization).

**Summary**

Aggregate analysis of variation in clinical care is a useful, but a very blunt instrument for attempting to isolate wasted healthcare dollars. On one hand, there is nothing more politically feasible than decreasing healthcare spending by eliminating waste. On the other hand, it is not always true that regional variation in spending (or even value) is driven by undesirable factors such as duplicated or unnecessary services.

The Dartmouth Atlas in particular has had an important impact on policy discussions through documentation of regional variation in health spending. However, the dominant Dartmouth Atlas methodology is also subject to some important criticisms.

More generally, it is crucially important to analyze all of the possible drivers of care in a particular treatment category or clinical episode as specifically as possible, unpacking the mechanisms driving variation in spending and/or outcomes. This perspective requires the policymaker to:

* Recognize that variation in healthcare spending and outcomes could reflect either desirable (e.g., driven by patient need or reasonable patient preferences) or undesirable (e.g., driven by unnecessary care) factors. Even undesirable variation might reflect under-use (compared to evidence-based recommendations) in low-spending areas.
* Isolate the underlying factors driving sources of variation in medical care. One methodology for doing so is to break down the patient’s path to care and look for variation at each possible decision or input point.
* Recognize that confidence in our results should increase with a specific understanding of the drivers of variation in care.

1. It’s not so important that you remember each specific step presented here; the specific steps will vary across countries, populations, and medical contexts. Instead, what I hope you will take away is a sense of the need to decompose and critically evaluate each distinct step involved in any particular diagnosis and treatment pathway, from a complete perspective, including aspects of both patients and providers. [↑](#footnote-ref-1)