Themed Section: PhRMA Foundation Challenge Awards

A Framework for Measuring Low-Value Care

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A B S T R A C T

Background: It has been estimated that more than 30% of health care spending in the United States is wasteful, and that low-value care, which drives up costs unnecessarily while increasing patient risk, is a significant component of wasteful spending. **Objectives:** To address the need for an ability to measure the magnitude of low-value care nationwide, identify the clinical services that are the greatest contributors to waste, and track progress toward eliminating low-value use of these services. Such an ability could provide valuable input to the efforts of policymakers and health systems to improve efficiency. **Methods and Results:** We reviewed existing methods that could contribute to measuring low-value care and developed an integrated framework that combines multiple methods to comprehensively estimate and track the magnitude and principal sources of clinical waste.

We also identified a process and needed research for implementing the framework. **Conclusions:** A comprehensive methodology for measuring and tracking low-value care in the United States would provide an important contribution toward reducing waste. Implementation of the framework described in this article appears feasible, and the proposed research program will allow moving incrementally toward full implementation while providing a near-term capability for measuring low-value care that can be enhanced over time.
Keywords: administrative claims, health spending, low-value care, measuring clinical waste.

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Introduction

Health care spending in the United States exceeds 18% of the nation's gross domestic product, and it has been estimated that more than 30% of this spending is wasteful [1]. Low-value care—a significant component of wasteful spending—not only drives up costs unnecessarily but also increases patient risk. Furthermore, reducing low-value care can allow resources to be redirected toward care that provides higher value. Traditional approaches to reduce spending, such as increasing a patient's exposure to health care costs through higher deductibles, co-pays, and co-insurance, have been shown to reduce both high- and low-value care indiscriminately. Instead, if we adopt a value-driven strategy to identify and eliminate the use of inefficient, low-value care, we can make room for increased use of underutilized and important innovative services. A vital component of such a strategy is a clear, data-driven understanding of the nature and extent of low-value care in the current health care system.

Recognizing the importance of identifying low-value care and tracking progress toward reducing its use, the Robert Wood Johnson Foundation has funded research to develop approaches for identifying and measuring the extent of wasteful spending in the United States. We anticipate that the resulting framework

will allow measurement of the overall magnitude and costs of low-value care at the health system, state, or national level. Such a framework can facilitate a more holistic and value-based approach to health care decision making.

A methodology for comprehensive measurement of low-value care in the United States should provide the ability to:

1. estimate expenditures on low-value care nationwide, by region, and perhaps by other dimensions (such as a health care system or payer);
2. identify the services that contribute most to this waste and the magnitude of the contribution to provide actionable information that allows remediation; and
3. update these estimates over time to allow tracking of progress.

This article summarizes progress toward developing such a methodology by 1) identifying three alternative approaches to measuring low-value care, 2) describing an integrated framework that combines multiple approaches to comprehensively estimate the magnitude of low-value care, 3) outlining a process for implementation of the framework, and 4) suggesting needed future research into measuring low-value care that will move the related science forward.

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Alternative Approaches for Measuring Low-Value Care

Major technical challenges to measuring low-value care include:

1. the large number of clinical services that contribute to low-value care;
2. the clinical nuance necessary to determine whether a service was of low value in the particular circumstance under which it was delivered; and
3. the fact that claims data—the most readily available source for identifying low-value care—frequently lack the clinical detail to make this determination.

To help address these challenges, we consider three alternative approaches for tracking low-value care. The additive approach hypothesizes that the wasteful services with the largest associated expenditures make up a substantial portion of low-value care (an "80/20 rule"), and that measuring the magnitude of this relatively small number of services will allow approximating total waste. The indicator approach hypothesizes that tracking a small number of low-value procedures that may signal systematic waste can provide input to statistical methods to approximate the overall magnitude of low-value care. The comparative approach hypothesizes that low-value care is best measured not by counting waste of individual procedures, but instead by analyzing total spending and relative patient outcomes across geographic or organizational units. Each approach has advantages and disadvantages; we conclude that a method that combines two or more of them provides the best opportunity for a feasible way to track low-value care.

Additive Approach

The most straightforward method of measuring waste is to count it additively. The additive approach involves identifying services that can have low value, identifying the circumstances in which their use constitutes low-value care, and measuring the frequency and cost of such low-value use.

A number of initiatives have identified individual services that are, under specified circumstances, deemed wasteful. The best-known of these is the Choosing Wisely campaign [2], under which more than 70 national organizations representing medical professionals have identified nearly 500 tests, procedures, and other services commonly used in their field whose necessity should be questioned and discussed. The US Preventive Services Task Force [3] develops evidence-based recommendations for the use of preventive services, including recommendations for circumstances under which such services should not be used. The Beers Criteria [4] are guidelines for health care professionals to help improve the safety of prescribing medications for older adults, with an emphasis on avoiding prescribing medications that are unnecessary. From these and similar initiatives (including international efforts such as Choosing Wisely Canada [5] and UK's National Institute for Health and Care Excellence [6]), we have identified and cataloged nearly 2500 recommendations within the United States and other nations for services that have been identified as wasteful under some circumstances (although some recommendations have been listed by multiple initiatives, resulting in significant overlap).

Several researchers (e.g., [7–10]) have developed algorithms for subsets of these services that, when applied to administrative claims data, estimate low-value expenditures associated with the services. These algorithms codify the clinical circumstances under which the services constitute low-value care such that they can be discerned using claims data. In addition, at least two private organizations—Anthem [11] and Milliman [12]—have developed more comprehensive sets of such algorithms that can be used in conjunction with claims data to estimate the frequency of low-value use of the services included in their research. We have experimented with such algorithms using an all-payer claims data set for the state of New Hampshire and have concluded that such an approach is feasible.

Nevertheless, because of the large number of services that can be of low value, applying the additive approach comprehensively would be impractical. If, however, a relatively small number of services accounted for a significant portion of expenditures on low-value care (the 80/20 rule alluded to earlier), limiting application of the additive approach to services anticipated to generate large amounts of wasteful spending might identify a significant portion of total low-value expenditures. A preliminary assessment in which we used existing literature to develop rough estimates of the frequency of low-value use of 48 high-expenditure services suggests that an 80/20 rule likely applies to low-value care. In addition, our review of data from an application of the additive approach to 44 services in the Virginia All Payer Claims Database [13] indicated that 10 of those services (23%) account for 80% of the low-value expenditures measured by that application, providing additional evidence for an 80/20 rule.

Another impediment to using the additive approach to estimate the total magnitude of low-value expenditures is that many low-value services require knowledge of the clinical details associated with the use of the service to determine whether that specific use constituted low-value care. In some cases, this clinical nuance is beyond that which can be inferred from claims data, which are the most readily available data for measuring low-value care. For example, the American Academy of Family Physicians recommends against performing "imaging for low back pain within the first six weeks, unless red flags are present"; nevertheless, the comprehensive identification of "red flags" is nearly impossible using claims data alone. (Some users of the additive method [7] have addressed this limitation by developing broader and narrower measures of low-value use of a service, leading to a range of estimated wasteful spending on that service.) Furthermore, some researchers [14,15] have concluded that even electronic health records (EHRs) are unlikely to provide adequate data to identify cases of low-value care for many services, either because the required data are unlikely to be available in EHRs or the recommendations are insufficiently precise.

An important advantage of the additive approach is that it is actionable. Because it measures low-value care by summing the magnitude of specific services that have been identified as having low value, it can be used to develop specific initiatives designed to reduce the inappropriate use of each of these services. But the limits of claims data (or even EHRs) to discern clinical nuance coupled with the sheer magnitude of the effort to track hundreds of low-value services suggest that the additive approach alone is unlikely to provide a method for comprehensive measurement of low-value care.

Indicator Approach

Like the additive approach, the indicator approach measures low-value care associated with specific services, but does so with a different purpose. The indicator approach is based on an assumption that low-value care is a systematic problem throughout the US health care delivery system. Rather than measuring low-value use of services expected to produce the most waste, this method targets a small number of services most likely to signal total systematic waste.

As an example of this approach, Segal et al. [16] identified 20 services whose low-value use can be identified using Medicare

claims data and for which the frequency of use varies significantly across geographic regions. They then used regression analysis to develop an index that characterizes regional variation in low-value use of these 20 services among the 306 Dartmouth Atlas hospital referral regions and showed that the index was highly positively correlated with total inpatient and outpatient costs in a region and was not directly associated with indicators of clinical benefit. The index thus appears to provide a plausible measure of the relative extent to which services systematically have low value across regions of the country.

Development of such an index and tracking its value over time across regions would provide a method for measuring progress in reducing systematic use of low-value care. Measurement of the index across regions can help identify locations in which it is especially important to address such systematic problems. Nevertheless, the indicator approach as currently developed does not allow estimating the magnitude of low-value expenditures, and nor does it allow identifying the specific services that contribute most to such expenditures.

Comparative Approach

While the additive and indicator approaches track low-value care associated with individual services, the comparative approach focuses on comparing spending across different geographical regions. If such spending estimates can be adjusted for differences in patient characteristics, the excess per-capita spending in one region provides a rough estimate of the magnitude of low-value care in that region. This is the approach developed by the Dartmouth Atlas Project [17] and used by numerous researchers to characterize and understand the large regional variation seen in health care utilization across the nation. The Dartmouth Atlas captures Medicare reimbursements per enrollee across hospital referral regions, adjusted for regional differences in age, sex, and race, but not for the effects of differences in patient preferences or sickness. Finkelstein et al. [18] have developed methods for isolating these latter effects. The comparative approach can be applied to individual services as well as to overall utilization [19,20].

When applied to aggregate expenditures, the comparative approach does not identify individual services that contribute to low-value care, but this limitation can be overcome by applying it to specific services. Other limitations include the difficulty in adjusting for all patient characteristics that can lead to utilization differences among regions, and the fact that it will not discern low-value care that occurs in all regions. (If all regions inappropriately used a particular service, the comparative approach would fail to identify some of this waste.) This approach, however, provides a method for approximating low-value care in situations in which application of the additive approach is infeasible.

The Framework

The advantages and limitations of the three aforementioned approaches suggest pursuit of a combined set of methods that exploits the strengths of multiple approaches while overcoming their limitations. A framework for such a combined methodology is illustrated in the flowchart shown in Figure 1. Chalmers et al. [21] identify two alternative "lenses" for quantifying care that is of low value, depending on whether the focus is on the fraction of patients receiving such care or the fraction of total services that are of low value. Because our framework is designed to measure the fraction of total expenditures that are of low value, it is most closely aligned with Chalmers' service (rather than patient) lens. Specific methods for accomplishing each step in the methodology are outlined hereafter, with suggestions both for methods that can be developed in the near term (to allow for implementation of a preliminary version of the framework as soon as feasible) and for those that would result in a more comprehensive and accurate long-term implementation.

The first step in the framework is to develop a comprehensive list of services that have been identified as potentially having low value, including criteria for determining the conditions under which a specific occurrence of the service constitutes low-value care. Our catalog of nearly 2500 (overlapping) services that have
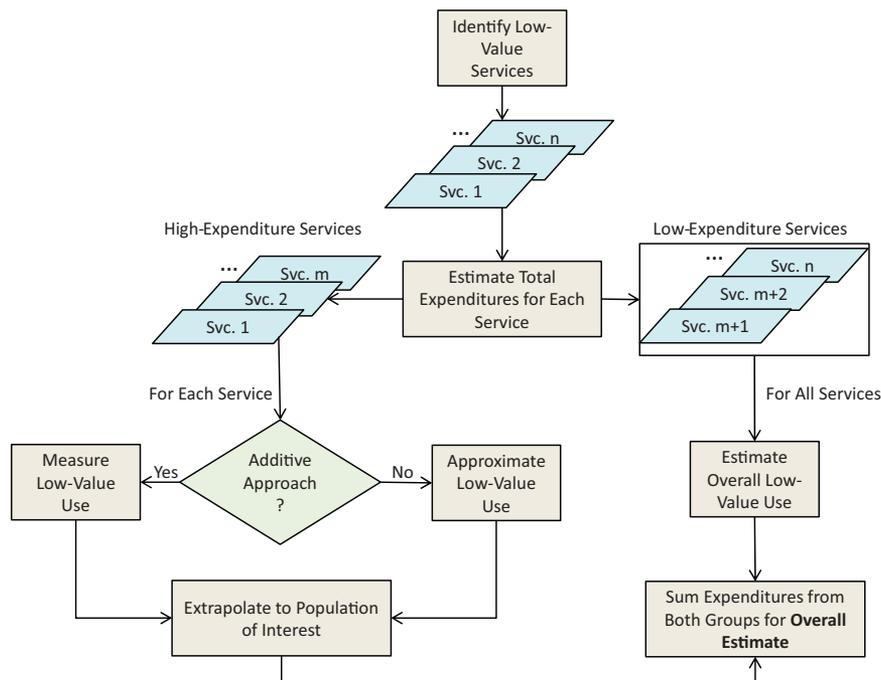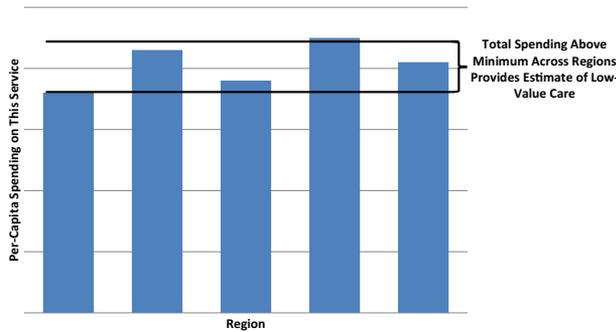

Fig. 1 – Low-value care framework.

Fig. 2 – Illustration of comparative approach.

been found to contribute to low-value care provides a starting point for such a list.

For each service in the list, the framework calls for estimating the total annual expenditures incurred on behalf of the population of interest (the nation, a state, etc.) for each of the listed services, whether or not those expenditures were of low value. This allows partitioning the services into two subsets: those for which high expenditures are incurred (as a preliminary indication that they might also result in high wasteful expenditures, thereby allowing exploitation of the 80/20 rule) and those associated with low expenditures. (Total annual expenditures by service are also used later in the process when extrapolating results to the entire population of interest.) Total utilization of a service can be estimated from a combination of sources such as Medicare claims, the Healthcare Cost and Utilization Project data sets [22], and the National Ambulatory Medical Care Survey and the National Hospital Ambulatory Medical Care Survey [23]. These utilization rates can be converted to estimates of expenditures using Medicare prices before adjusting for regional differences in Medicare payment rates. These estimates (and those developed in the steps that follow) will not capture the actual prices paid for the services, but rather isolate the impact of low-value use from that of price variation. (In a parallel effort, we are developing methods to measure wasteful spending associated with price variation. Using standard prices in measuring low-value care ensures that these parallel efforts do not double-count the effects of these two sources of wasteful spending.)

For each of the high-expenditure services, the framework calls for determining whether the additive approach can be used to estimate low-value occurrences of the service. If algorithms have been (or, in the longer term, can be) developed to identify low-value occurrences using claims data (possibly in conjunction with EHR data in the longer term), these should be applied to the broadest set of data available that is representative of the population of interest to estimate the frequency and expenditures associated with low-value use of the service for the population represented by the data. These estimates can be refined over time as more data become available.

If such algorithms cannot be developed (for reasons discussed earlier), other methods must be used to approximate the magnitude of low-value care. A simple method would be to estimate the fraction of occurrences of a service that constitute low-value care to be equal to the average fraction of low-value use associated with the services addressed with the additive approach. This method might be refined by applying the measured fraction constituting low-value care for a subset of services most similar to the service for which the additive approach is infeasible. Although individual services vary significantly in their frequency of low-value use, we are investigating the accuracy of applying this extrapolation method to aggregates of similar services. In the longer term, the comparative approach, applied to each service

individually, would provide another means to estimate low-value expenditures (Fig. 2), although it would require a regional partitioning of the service-specific total expenditures.

It is unlikely (at least in the near term) that claims data characterizing the entire population of interest (such as the entire US population) will be available for application of the additive method. It will therefore be necessary to extrapolate the estimates of service-specific low-value use to the broader population. A simple method for near-term application would be to assume that the fraction of occurrences of a service that constitutes low-value care in the measured population applies to the entire population of interest. This fraction would be applied to the total annual expenditures for the service that were identified earlier. This method could ultimately be refined via statistical analysis that relates low-value spending in the broader population to measured rates of low-value use as a function of demographic and other population characteristics, using regression methods similar to those developed by Reid et al. [24]. Alternatively, sampling weights across patient characteristics could be used to extrapolate measured low-value use to the broader population.

In contrast to the service-specific analysis for high-expenditure services, the framework treats low-expenditure services in the aggregate to promote computational feasibility. A simple initial approach could be to apply the overall fraction of spending estimated for the high-expenditure services to total spending on low-expenditure services. In the longer term, the comparative method could be applied to regional estimates of aggregate spending on low-expenditure services.

The final step in the framework is to add the estimates of low-value spending for high- and low-expenditure services to produce an overall estimate of annual low-value spending for the population of interest, as well as to compute the percent of total spending constituting low-value care.

Future Research

This framework, and preliminary empirical efforts underway to develop and test the concepts embedded within it, provides a roadmap for the implementation of an initial low-value care tracking system in the near term, followed by a series of enhancements to improve the system's accuracy and utility. Important enhancements would include:

1. incorporating additional claims data sets for use with the additive approach;
2. adding algorithms for use of the additive approach with services for which algorithms do not currently exist;
3. partitioning of service expenditure estimates and claims data into regions for use with the comparative approach;
4. exploiting this partitioning by applying the comparative approach to services for which algorithms do not exist; and
5. using increasingly sophisticated methods to refine the estimated share of waste for the entire population of interest via the use of regression analysis or representative weights across population segments.

The nature and timing of these enhancements can be informed in part by lessons learned from early experience with the initial version of the system. At the same time, the initial version will provide a near-term capability for comprehensive measurement of low-value care.

An important limitation to the framework is that it does not allow capturing the downstream costs triggered by the use of low-value services, such as those associated with following up on positive results of low-value screening or addressing

complications caused by the use of low-value treatments. Development of methods for measuring these total costs associated with low-value care is an important topic for future research. An additional limitation is that our framework has an economic focus that ignores the potential harm to patients that can result from low-value care. Another topic for future research is the development of methods to estimate the total harm associated with such care, measured, for example, in quality-adjusted life-years lost.

Conclusions

Implementing a comprehensive methodology for measuring and tracking low-value care in the United States would make an important contribution toward reducing waste. Statistics produced by the methodology (perhaps made available via an online dashboard) could provide useful input to the efforts of policy-makers and health systems to curb waste in health care and to track progress toward greater efficiency. The framework presented here provides a roadmap for the implementation of such a methodology. Although the efforts required to implement the methods inherent in the framework suggest a long-term research program, early implementation of an initial version of the methodology would provide a near-term capability to measure low-value use precisely for some high-expenditure services and produce an approximate measure of overall low-value care.

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