Clinician Feedback on Using Episode Groupers with Medicare Claims Data

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CMS is investigating techniques that might help identify costly physician practice patterns. One method presently under evaluation is to compare resource use for certain episodes of care using commercially available episode grouping software. Although this software has been used by the private sector to classify insured individuals' medical claims into episodes of care, it has never been used with fee-for-service Medicare claims except in the studies by the Medicare Payment Advisory Commission (MedPAC) and CMS. This study reviews and reports on clinician feedback on the most obvious and important decisions that must be faced by Medicare to use grouped claims data as the foundation for a physician performance measurement system. The panel reactions show the importance of bringing persons with clinical knowledge into the development process. The clinician feedback confirms that additional research is needed.

INTRODUCTION

Policymakers have expressed concerns that the current Medicare payment system includes incentives that encourage physicians to overuse some services and underuse others; pays physicians for care irrespective of their level of resource use; and offers higher revenues to physicians who furnish more services, regardless of whether they add value (Medicare Payment Advisory Commission, 2005). To remedy these concerns, the concept of value based purchasing (VBP) has been introduced into the policy arena. The goal of a VBP program is to find ways to reward physicians financially for providing efficient use of resources and services that are of high quality. The Medicare Improvements for Patients and Providers Act of 2008 (MIPPA) requires the Department of Health and Human Services (DHHS) to develop a plan that will transition Medicare payments into a VBP program for physician and other professional services that is based on efficiency and the quality of services provided. The Act also requires the DHHS to disseminate informational reports to physicians using episode groupers and/or per capita measures.

CMS has been investigating techniques that can help identify higher cost practice patterns. One technique is to compare resource use at the episode of care level. Episodes of care represent a group of healthcare services (claims) for a health condition (e.g., hip fracture, diabetes) over a defined length of time for which a physician can be responsible. The Medicare Payment Advisory Commission (MedPAC) has argued that compared with traditional population-based metrics, episode measurement could:

- Allow the attribution of care to individual physicians;
- Avoid focusing on a narrow set of utilization measures at the expense of others;

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- Help identify specific changes in practice that can improve cost efficiency relative to peers; and
- Provide better accounting for differences in inpatient health status (Medicare Payment Advisory Commission, 2005).

Existing episode groupers are proprietary software programs that organize an individual's claims into clinical episodes of care. In its March 2007 report, MedPAC stated that "episode groupers can be used with Medicare data." After 2 years of study with Medicare claims data, MedPAC concluded that episode groupers have face validity from a clinical perspective, can identify practice patterns, and have risk adjustment capabilities that can account for differences in disease severity and the presence of comorbidities (Medicare Payment Advisory Commission, 2007).

While existing episode groupers have been developed for and used in private sector health plans and insurers as management tools, these grouping software programs have never been used in fee-for-service Medicare. As a result, Acumen, LLC under contract to CMS began studying episode groupers using 2006 Medicare claims data. Acumen produced two publicly available reports: one on the functionality of the two commercially available groupers, and the other on issues in using grouped episodes to create resource utilization reports.[1] These studies use quantitative analysis to explore how the episode groupers work with Medicare claims data.

This study focuses on the major design issues that should be addressed if episode grouping software is to be used with Medicare claims data. Eight panels, which in aggregate consisted of approximately 80 clinicians, were asked to respond to a series of episode grouping issues, which were identified after studying Medicare claims data that had been grouped with two commercially available software products. The panels were not asked to determine the most appropriate commercial episode grouper for Medicare claims, but to discuss design issues that must be considered in developing episodes in a value based purchasing context regardless of the episode grouping software used.

BACKGROUND

Episode groupers are proprietary software programs that organize claims data into a set of clinically coherent episodes, usually linked by diagnosis. Two proprietary episode groupers were available: INGENIX Symmetry's Episode Treatment Groups (ETG) and the Thomson / Reuters Medical Episode Grouper (MEG). The episode groupers build episodes of care using all of a beneficiary's health care claims that are filed between two points in time for a specific health problem. The aggregate dollar amount of claims payment constitutes the cost of an episode. Thus, the design issues of what claims to include in an episode and how to include them are relevant to studying an efficient level of cost for an episode type. Conceptually, episode costs can be attributed to a physician and then compared across physician practices.[2]

The episode grouping software requires users to specify the input parameters for a given set of outputs. The user determines the types of claims data that will be grouped, the time frames for which the data are collected, the various software profile settings, the physician attribution and benchmarking algorithms, and the outputs that will be provided to clinicians,

[1] See http://www.cms.hhs.gov/Reports/downloads/MaCurdy.pdf and http://www.cms.hhs.gov/reports/downloads/MaCurdy2.pdf

[2] Ideally, physician efficiency should also include outcome measures or other measures of quality. Low cost, by itself, is not necessarily a desirable goal.

among other decisions. Because of this flexibility and the substantial user involvement, no one correct episode grouping method exists.

To construct an episode, claims are generally linked by diagnosis code(s). Episode types can be characterized as chronic, acute, or preventive care. Chronic condition episodes are defined for episode grouping purposes as having a 12-month duration, usually a calendar year, even though by definition, a chronic condition does not end. Acute episodes can start at any time during a year and may continue into a subsequent calendar year. Acute and preventive care episodes are generally much shorter in duration, and are considered complete or "closed" when there is no activity within a given period, i.e., when a "clean period" is reached. For example, if no claims for hip fracture are encountered 90 days after the last such claim, and the clean period is defined to be 90 days, then the episode is deemed complete. Only certain claim types can initiate or open an episode. In both episode groupers, physician Part B evaluation and management claims or surgery claims, an inpatient hospitalization, or a skilled nursing facility stay can start an episode. Ancillary claims and durable medical equipment claims cannot start an episode in either episode grouper, while home health claims and hospice claims may start an episode in one episode grouper. Since a person can be treated for many conditions at the same time, episodes may be open simultaneously for different conditions.

Few independent evaluations of episode grouping software have been published, and only two studies, both funded by CMS, have used Medicare claims data. The first CMS report on episode grouping by Acumen, LLC, entitled "Evaluating the Functionality of the Symmetry ETG and Medstat MEG Software in Forming Episodes of Care Using Medicare Data," concludes that (1) the grouping algorithms do not emulate practice patterns common in the Medicare system, (2) inpatient physician services often do not group with the associated hospital stays, and (3) there is considerable variation in costs across episodes and within episode types." This large variation in episode costs "…suggests the need to develop models of risk or severity adjustment applicable for Medicare populations prior to being able to use the episodes … software for profiling Medicare providers" (MaCurdy, 2008a).

A second CMS report by Acumen, entitled "Prototype Medicare Resource Utilization Report Based on Episode Groupers," discusses practical aspects of implementing resource utilization reports using episode groupers. Options are given for apportioning cost into episodes, assigning physician attribution rules, defining relevant peer groups, adjusting costs, and developing peer group cost benchmarks. Empirical analysis is performed on the number of episodes required for valid comparisons (MaCurdy, 2008b).

METHODS

In the summer of 2008, two panel discussions were organized at each of four large multi-specialty group practices: Geisinger Health Systems in Danville, Pennsylvania; Billings Clinic in Billings, Montana; St. John's Health System in Springfield, Missouri; and Marshfield Clinic in Marshfield, Wisconsin and Wausau, Wisconsin, for a total of eight panels. For each panel, 8 to 12 clinicians met for approximately three hours to discuss episode grouping issues, a total of 80 mostly physician participants

for all of the panels. The composition of each panel was influenced by the type of condition that was to be discussed. For example, orthopedic surgeons were overrepresented on a panel that focused on hip fractures. Most panel participants were not familiar with episode grouping software and value based purchasing concepts. One site, however, had used an earlier version of one episode grouper to monitor resource use in their health plan division; although clinicians at this site were aware of the grouping basics, they were not familiar with the discussion questions and design issues that would be posed.

After listening to a brief presentation on VBP, episode grouping basics, and episode design issues, the panel members were asked to discuss the types and combinations of health care claims for which a physician should be held accountable. In addition to examining overarching episode design issues, each panel also focused on one of the following five clinical conditions: chronic obstructive pulmonary disease (COPD), hip fractures, diabetes, congestive heart failure (CHF), and coronary artery disease (CAD).[3] Two clinical conditions were discussed at each site. A physician under contract to CMS made the introductory presentation to each panel and led the subsequent discussions. Kennell & Associates, Inc., under contract to CMS, organized the panels, conducted the meetings, and prepared notes. CMS staff also attended the meetings.

The presentation on VBP and episode grouping basics was prepared by CMS and Kennell & Associates, Inc. staff using policy papers and software documentation provided by the vendors of the commercial episode grouping software that were used to prepare claims data for review by the panels. Episode design issues were developed in advance of the panels by reviewing the issues identified in Acumen's first CMS report on episode grouping (MaCurdy, 2008a) and by examining how the two episode groupers linked Medicare claim types at each site. Using the algorithms developed for the 2008 report on functionality, Acumen, LLC then grouped the 2004-2006 claims at each study site, so that each panel would be exposed to examples of how their own claims had been grouped. Design issues were identified by comparing the relationship of grouped claims and claims types across episodes to expected treatment patterns. For example, how were inpatient physician claims grouped when the physician claim diagnosis differed from the inpatient hospital diagnosis? This article identifies and explains significant design issues, and then discusses the reactions to them by the clinician panels.

Claims analysis was conducted at the "base episode" level, without incorporating risk adjustment methodologies or severity levels (i.e., 4 disease stages in MEG and up to 4 severity levels in ETG). In this way, the panels could more easily focus on the fundamental design issues. If a discussion required an explanation of these adjustment methodologies, the panel was given this information. Rather than quantifying positions taken (such as the percentage advocating a particular position), this study used a qualitative approach to synthesize the positions, arguments, and insights provided by the approximately 80 clinicians who voluntarily participated. Summarized below are the panel discussions, which reflect the thoughts of the panels, and not CMS.

[3] These conditions were selected from a subset of acute and chronic conditions that are highly prevalent in the Medicare population.

FINDINGS

Grouping Physician Claims with an Inpatient Hospital (IP) Stay

During an inpatient hospital stay, patients often receive services from many physicians. The grouping of inpatient Part B physician claims is complicated because Medicare patients typically have co-morbid conditions that also are treated during an inpatient stay. Consequently, inpatient physician claims associated with the treatment of conditions in their specialty may include a diagnosis code that differs from the principal diagnosis shown on an inpatient facility claim. Since the diagnosis code is normally used to link claims into one episode, matching Part B physician claims with an inpatient facility claim may be problematic if the diagnosis codes differ.

As an example, a patient hospitalized for a hip fracture may also need to be treated by an internist for hypertension. In this case, the Part B claim from the internist's evaluation and management service could have a diagnosis code for hypertension, but not a diagnosis (or procedure code) for hip fracture. In contrast, the inpatient hospital claim would show a principal diagnosis related to the hip fracture procedure (as would the diagnosis on the surgeon's Part B claim). The episode grouping software must assign the internist's Part B claim to one and only one episode: that is, either to the hip fracture episode or to a hypertension episode. Since Medicare's payment for a physician service is based on the CPT code (reflects procedure or type of visit) rather than on the diagnosis, physician offices have no incentive to spend much effort in coding a diagnosis. In contrast, the payments hospitals receive are determined by a combination of diagnosis and procedure codes.

Based on grouping options available in one episode grouper, two design strategies can be used to link inpatient facility and professional Part B claims. In this study, these strategies are termed the "diagnosis method" and the "date of service method." The "diagnosis method" assigns Part B claims to episodes during an inpatient stay according to the diagnosis (and sometimes procedure) on the claim. In linking claims primarily by diagnosis, a high percentage (44 percent in ETG; 60 percent in MEG) of the Part B physician claims provided during an inpatient stay was assigned to an episode that did not include the inpatient hospital facility claim (MaCurdy, 2008). In contrast, the "date of service" method assigns Part B claims during an IP hospital stay according to the date on the Part B claim, regardless of the diagnosis information on that claim. This option will also group claims for unrelated conditions into that episode. The key points from the panel discussions are summarized below:

Use the date of service method: Some physicians concluded that much of the care would not have been done without a hospitalization; therefore, according to this perspective, all physician services during an inpatient stay should be grouped into the same episode as the inpatient stay. The diagnoses shown on inpatient physician claims may not be accurate, since Medicare physician payments are not determined by diagnoses, as they are for inpatient hospital services. Therefore, using inaccurate diagnoses to link claims may not construct reliable episodes.

Use the diagnosis method: The prevalence of chronic co-morbidities often requires multiple inpatient consults for different conditions; therefore, some argued that physician claims should be grouped by diagnosis. A single patient may have multiple concurrent episodes

of illness. Grouping all inpatient consults into the same episode as the inpatient stay may provide an incentive for physicians to avoid treating co-morbid conditions during an inpatient stay. Therefore, some panelists favored using the diagnosis on the Part B claims for grouping.

Grouping an IP stay with Skilled Nursing Facility (SNF) Claims

Medicare pays for post-acute care in SNFs following an inpatient stay (having duration of at least 3 days) and related to the condition of the hospitalization. Based solely on matching the principal diagnoses using the "diagnosis method," Acumen, LLC found that both groupers link SNF claims that immediately follow an IP stay (not necessarily the qualifying inpatient stay) in only about 50 percent of the episodes that contain the inpatient facility claim. However, the "date of service" method can be adapted for SNF claims in one episode grouper. The date of service method will group a SNF claim in the same episode as the IP claim only if the date of the hospital discharge is the same as the date of admission to the SNF. With this adaptation, 95 percent of SNF stays following an IP stay will be grouped into the same episode as the inpatient hospital stay. The panelists were asked about the appropriateness of applying the "date of service method" and the "diagnosis method" in grouping Medicare SNF claims immediately following a hospital stay. The discussion points are summarized below:

Use the date of service method: A SNF stay immediately following a hospitalization is usually related to the same medical condition as the inpatient stay. Including SNF claims in the same episode as the inpatient hospital claim may give physicians an incentive to manage the inpatient stay better in order to avoid a SNF placement.

Use the diagnosis method: The SNF stay may not necessarily relate to the preceding IP hospital stay. Some patients can have multiple SNF claims following an IP hospital stay. In these situations, the second SNF stay may reflects the patient's underlying condition or frailty rather than the acute condition that required hospitalization, making it most sensible to group the SNF claim separately from the episode containing the claim for the preceding inpatient stay. For example, dementia and other mental impairments listed as the triggering diagnosis on a SNF claim may indicate SNF care in order to ensure adequate post-acute treatment. In these cases the SNF cost should be attributed to a dementia episode, not the condition that caused the hospitalization. In these examples, if SNF care is always included with the inpatient episode the quality of care might suffer since physicians may have a financial incentive to avoid SNF placements.

Grouping an IP stay with Home Health (HH) Claims

In contrast to SNF, a prior hospitalization is not needed to access the Medicare HH benefit. However, HH services immediately following a hospital stay can be grouped into the same episode as the inpatient stay using the date of service method, or be grouped by the diagnosis method. The need for automatically grouping HH claims into the same episode as the hospitalization was questioned by many panel members, who argued that HH should often be excluded from the same episode as the hospitalization. The discussion points are summarized below:

Use the date of service method: HH care is part of the continuum of care; therefore,

should be included in the same episode as the IP hospital stay when measuring physician resource use.

Use the diagnosis method: While many panel members were not in favor of automatically grouping HH claims with the IP stay, there also were significant concerns about the alternative grouping approach based on the HH claims' diagnoses, which many panel members considered to be unreliable and inaccurate.

Exclude HH from episode grouping altogether: Some panel members argued to exclude HH claims from any episodes because too many may have unreliable diagnoses and may be unrelated to the condition for the hospital stay. Therefore, neither the date of service method nor the diagnosis method should be used to group claims. Also, the variation in HH utilization may be influenced by factors beyond a physician's control, including the degree of local availability of HH services, the degree of social support in the patient's home, and the fact that HH agencies largely control the resource utilization after the initial physician order is given.

Duration of Chronic Episodes

By definition, chronic conditions are ongoing and open-ended. To construct an episode to measure resource use, a practical time convention is needed. Both episode groupers use a 12-month period, usually a calendar year, to measure the costs for chronic conditions. In general, most clinicians were comfortable with using a 12-month period as the convention. Some clinicians thought that the grouper logic should be refined to automatically open a new chronic condition episode in the succeeding 12 month period if the patient had the chronic condition in the past. The grouping software will not open an episode unless a qualifying claim is encountered in the data. The grouping software can only work on the data sets determined by the user, and do not have a "memory" of the prior period data.

Identification of Acute Exacerbations

Episodes for a chronic condition can be described as being for maintenance, such as on-going evaluation and management office visits, and/or include acute exacerbations or flare-ups, such as a hospitalization. One episode grouper has an option for separating certain acute exacerbations from the chronic maintenance episodes in five conditions, while the other groups claims for acute exacerbations with chronic maintenance episodes. For example, claims for Acute Myocardial Infarction (AMI) would be grouped into its own acute episode in one episode grouper, but included in a coronary arterial disease (CAD) episode in the other. The panels were asked if acute exacerbations should be separated from chronic maintenance episodes, or if they should be included in the same chronic condition episode.

Separate acute exacerbations from chronic maintenance episodes: Acute exacerbations should be broken out from chronic maintenance episodes because the flare-ups are frequently not treated by the physician responsible for a patient's chronic maintenance. Some specialists predominantly treat patients who have an acute exacerbation, and do not treat their ongoing maintenance. An attribution issue could arise for these types of cases if acute exacerbations are not separated. Many factors can influence the overall management of chronic episodes, such as patient non-compliance, and disease progression, over which a physician has little or no control.

Keep acute exacerbations with the chronic condition: The majority of clinicians favored leaving flare-ups in the same episodes as the chronic condition, because part of a physician's role should be to minimize flare-ups and inpatient admissions. Some clinicians suggested that combining flare-ups with the chronic condition episode may be less of an issue if the risk adjustment methodology is adequate (since sicker patients may be more likely to have acute flare-ups).

Complications of Medical and Surgical Care

One grouper has an episode type termed "complications of medical and surgical care."[4] In this episode type, claims for a readmission (e.g., a reaction to an implant) will not be grouped into the same episode as the original surgery. The other episode grouper's assignment of the readmission generally will depend on the extent to which that claim's diagnosis appears to match an open episode. Orthopedic surgeons in two panels that focused on hip fractures were asked if claims for complications of surgery should be grouped into the same episode as the original surgery or be grouped into a new episode. The discussion points are summarized below:

Create a new episode for complications of surgery: If the original surgeon has no control over the readmission, then a new episode should be opened. Some complications are random and due to a patient's co-morbidities and other factors beyond the control of a physician. This arrangement could more easily facilitate attribution, since the same surgeon may not perform both procedures.

Group the complication with the initial episode: Most panelists thought that the complications associated with the original procedure should be included in the same episode as the initial surgery, as doing so could lead to a better measure of physician resource use. By separating the "problem" readmission from the initial procedure, the accountability for the readmission would be lost. One clinician wondered whether risk adjustment methodologies could account for complications. If so, the case for including claims arising from complications with the original surgical episode may be strengthened.

Exclusion of Certain Claims Types

The grouper software user defines the claim types that are to be grouped. In the episodes constructed for this study, all Medicare Part A and B claims were used. Pharmacy claims in Part D could not be accessed, and therefore, were not included as part of the episode costs. Several claims types were identified for discussion, because they represented claims for which a physician may or may not be held responsible. The following summarizes the discussion on these types of claims:

Durable Medical Equipment (DME) claims: Acumen, LLC analysis found that a large proportion of the DME claims (almost 50 percent in one grouper) were ungroupable, as a result of the episode groupers' algorithms for grouping claims or the presence of invalid diagnosis on the claims. While many of the DME claims will not be grouped, most panelists thought that DME should be included when measuring physician resource use, even though the diagnoses on DME claims may not be reliable.

[4] Acumen, LLC found this episode to be usually listed in the top 10 episodes based on aggregate cost.

[5] Across the five conditions we focused on in this study, ambulance claims represent approximately 2 percent of the average episode cost.

Ambulance claims: Almost all clinicians believed that ambulance claims should be excluded from an episode because physicians lack control over ambulance usage and these costs can vary significantly based on geographic factors.[5] Some clinicians expressed particular concern about including the high cost of an air ambulance in an episode. Some clinicians argued that the episode costs should not include any services provided prior to their first contact with the patient for a health condition, since they have no ability to influence the care or treatment until then.

Hospice claims: Physicians in two panels were asked whether hospice care should be included in measuring physician resource use. Most panel members believed that hospice care should be included based on the philosophy that the full continuum of care should be recognized when measuring resource use.

Other Concerns

Concerns about implementation issues for grouping Medicare claims were expressed in all panels and are summarized below:

Logic validation: Many clinicians mentioned that individual physicians would not have the time or expertise to understand the details of an episode grouper's clinical logic. Consequently, they believed that CMS would have to validate the grouping logic as it applied to Medicare claims before episode groupers could be used in a value based purchasing system.

Risk adjustment: All panels raised concerns about the adequacy of risk adjustment. Panel members viewed risk adjustment as an essential step in using episode grouping for reporting on physician resource use. If physicians believe that the risk adjustment methodology cannot differentiate sicker, more complex and/or frail patients from healthier patients, they will have incentives to avoid treating sicker patients.

Homogeneity of episode costs: Panel members were concerned that the cost for a health condition can differ so greatly within an episode, even in the same practice. In one panel meeting, several orthopedic surgeons asked how very expensive or very inexpensive procedures could be included in a hip fracture episode. Specifically, an inexpensive procedure that uses screws or pins to secure the hip of a seldom ambulatory frail elderly nursing home resident may be indicated, compared to an expensive femur head implant that may be used for a younger, more active person. Since diagnosis is used for grouping, the type of and cost of the procedure is not considered in the grouping process. The orthopedic surgeons questioned how the difference in procedure costs and complexity could be remedied with risk adjustment because the differences in cost and procedure are not a matter of co-morbid conditions.

Adequate sample size: Concern was expressed that the efficiency scores generated with grouped claims data would have an insufficient sample size for statistically validity. The details and criteria for a sufficient sample size were beyond the scope of this study and depend in part on attribution rules. Preliminary analysis of episode grouping data by Acumen, LLC suggests this issue may be a challenge.

Valid peer groups: A strong consensus emerged that great care must be taken when defining the peer group against which a physician or practice would be compared. Of particular concern among the rural group practices was that they would be compared to practices in urban settings, which face different treatment and care issues.

Transparency: Panel members expressed the need for transparency in claim assignments and in how efficiency scores for physicians would eventually be calculated. In the two episode groupers that were studied, claims for medical care of any kind are processed through the episode grouper software and assigned into any of up to roughly 500 different types of episodes. Episode groupers also allow for overlapping simultaneous episodes. The algorithms used to group claims cannot be displayed in a simple to understand branch and tree diagram, such as the DRG system. Because of the complexity of the grouping software, it can be difficult to comprehend how and why the claims are grouped.

Actionable information: Only with actionable information could physicians understand their relative performance and how they could improve their efficiency. Panel members were concerned that a simple bottom line efficiency score would require the need for such detail, but by itself, would not be informative about what kinds of patient management decisions were driving results. Rather, physicians want to know the reasons why their practice was more or less costly than their peers.

Quality performance: Any system for measuring physician efficiency must also include measures of quality, since lower expenditures may result from an unacceptable level of quality. Including quality measures into the relative performance was viewed by panel members as an important component in mitigating potential perverse incentives that might otherwise arise in response to efficiency measurement. Quality adjustment of episodes is conceivably just as important as risk adjustment of episodes.

Rural Issues: The panels at one site believed that their remote location affects practice patterns, increasing costs of treating Medicare patients. Clinicians were also concerned about how valid comparison group costs, such as those used in defining benchmark costs of efficient episodes, would be if resource use reporting did not consider rural frontier issues.

CONCLUSION

This article reported clinician's reactions to seven episode grouper design issues: (1) grouping physician claims with an IP hospital stay, (2) grouping an IP stay with SNF claims, (3) grouping an IP stay with HH claims, (4) excluding certain claims types, (5) grouping complications of medical and surgical care, (6) grouping acute exacerbations, and (7) defining the duration of chronic episodes. In addition, concerns were voiced about validating the grouper logic, risk adjustment, homogeneity of episode costs, adequate sample size, the validity of peer groups, transparency, actionable information, quality performance, and rural issues. The panel reactions show the importance of bringing persons with clinical knowledge into the development process. The clinician feedback confirms that additional research is needed. This conclusion is consistent with the findings from the Institute of Medicine (IOM) regarding rewarding provider performance: "numerous challenges must be faced in the development, implementation, and ongoing evaluation of performance measures. Multiple methodological considerations—risk adjustment reflecting patient populations of varying acuity, small sample sizes at the individual practitioner level, … and attribution of responsibility among multiple providers … have already been identified as high priority areas for further research…" (IOM, 2006). Clinician insights will be an

indispensable element in the execution of this research.

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