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Measuring patient safety: the Agency for Healthcare Research and Quality's patient safety indicators

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Abstract

There is a lot of interest in patient safety, but there is still little useable national level information on the actual magnitude of patient safety problems that can be used by providers and policy makers to judge performance. The AHRQ Patient Safety Indicators (PSIs) are a set of measures that can be used with hospital inpatient administrative (discharge) data to provide a perspective on patient safety. They screen for problems that patients experience as a result of exposure to the healthcare system and that are likely amenable to prevention by changes at the system or provider level. There is a growing interest in the possible use of the AHRQ PSIs in international settings. The Organization for Economic Cooperation and Development (OECD) maintains an ongoing project on Health Care Quality Indicators (HCQI) and whose goal is to develop a set of quality indicators that can be used to reliably assess quality of care across countries and raise questions about differences in quality of care internationally. Work is ongoing though a partnership between AHRQ and the Italian National Observatory on Health in the Italian Regions to test the AHRQ QIs with the Italian national hospital discharge data set. Preliminary results indicate that many of the operational issues associated with differences in coding schemes and data set structure are surmountable. With additional refinements on their clinical specificity, increased stability in their definitions over time to permit long-term monitoring and country interest within organizations such as the OECD to build on the existing scientific work of these indicators, their to help answer questions about patient safety worldwide will be significantly enhanced.

Key words: patient safety, quality, indicators

Introduction

Patient safety has emerged in the past several years in both the political and the scientific arenas as a topic of interest and importance. The advent of the World Alliance on Patient Safety, the UK European Union Presidency priority of Patient Safety and the publishing of seminal scientific works on patient safety, such as the US Institute of Medicine's *To Err is Human* are all testimony to this phenomenon. It is only in light of this increased interest that research evidence documenting the magnitude of the patient safety problem has been compiled and reported. Researchers found that, in some hospitals in the states of New York, Utah, and Colorado, injuries resulting from medical management occurred in about 2% of all hospitalizations with up to 14% of these injuries resulting in death, and up to 7% resulting in permanent disabilities. [1-4] Moreover, these adverse events (according to Kohn an adverse event is "an injury caused by medical management rather than the underlying condition of the patient. An adverse event attributable to error is considered a "reventable adverse event") were not limited to particular areas of hospitals such as the operating room. Research has shown that medical errors and adverse events occur frequently after discharge from the hospital, and these include serious adverse symptoms from medication and disability.[5] Internationally, some recent examinations of patient perceptions of patient safety show that issues such as uncoordinated care and perceived safety of care are topics of concern in a wide range of countries. [6]

Creating the Patient Safety Indicators Set

Despite the amount of interest in patient safety, there is still little useable national level information on the actual magnitude of patient safety problems that can be used by providers and policy makers to judge performance. Of the data that does exist, none of it is collected and reported on an ongoing basis, making monitoring impossible. The Agency

for Healthcare Research and Quality's (AHRQ) is an operating division of the US Department of Health and Human Services (HHS). AHRQ's mission is to improve the quality, safety, efficiency, and effectiveness of health care for all Americans. As part of this mission, AHRQ has developed a set of health care decision making and research tools that can be used by program managers, researchers, and others at the Federal, State and local levels to measure performance and patient safety. One of these tools is the AHRQ Quality Indicators (QIs), which use hospital administrative data to highlight potential quality concerns, identify areas that need further study and investigation, and track changes over time. The AHRQ QIs are a set of measures that are organized into three "modules," each of which measures quality associated with processes of care that occur in an outpatient or an inpatient setting. All three modules rely solely on hospital inpatient administrative data and are shown in Box 1.

The AHRQ PSIs are a set of measures that can be used with hospital inpatient administrative (discharge) data to provide a perspective on patient safety. Specifically, they screen for problems that patients experience as a result of exposure to the healthcare system and that are likely amenable to prevention by changes at the system or provider level. These are referred to as complications or adverse events.

Using the AHRQ Quality Indicators for Reporting and Improvement

The AHRQ QIs were developed to be used to track progress in performance-at a national, state, and local level as well as track improvement in patient safety. Evidence shows that public reporting performance is a key element that promotes enhanced patient care. Originally, the AHRQ QIs were designed with the goal of creating tools for quality tracking and improvement and have been extensively used for these purposes.

While the focus of the initial QI development work was not on hospital-level comparative reporting or other uses of the measures for purchasing and payment, the increased demand for standardized hospital-level comparative data in a time of growing quality concerns has led to their adoption for these purposes. AHRQ undertook an analysis to determine their appropriateness for these uses and concluded that these indicators can be used both for pay for performance and hospital-level comparative reporting given certain caveats. This analysis resulted in a document that provides detailed information about the use of the QIs for hospital comparative reporting and pay for performance–*Guidance for Using the AHRQ Quality Indicators for Hospital-level Public Reporting or Payment,* which is available on the web at http://www.qualityindicators.ahrq.gov/ In many cases, the use of the QIs and in several cases the PSIs for purposes of comparative reporting has been at the state level or by local institutions seeking to improve patient safety. One example of this use is presented in the figure below (Box 2).

The AHRQ PSIs were not originally intended for national reporting purposes. However, work by the Agency, its Department of Health and Human Service and private sector partners such as Medstat and Social and Scientific Systems resulted in significant data development for the use of the PSIs in the first, second and third US National Healthcare Reports on Quality and Disparities. The data used for reporting national statistics on the PSIs in these reports was based on the Healthcare Cost and Utilization Project's (HCUP) Nationwide Inpatient Sample. Additional information on HCUP and the Nationwide Inpatient Sample as well as the NHQR data analysis is available at the two websites: HCUP: http://hcup.ahrq.gov/HCUPnet.asp and at the NHQR web site www.qualitytools.ahrq.gov.

The use of the PSIs in the first US National Healthcare Quality and Disparities Reports (NHQR and NHDR) in 2003 represented the first

Box 1. The AHRQ Quality Indicator Modules

Prevention Quality Indictors (PQIs) or ambulatory care sensitive conditions—identify hospital admissions that evidence suggests could have been avoided, at least in part, through high-quality outpatient care

Inpatient Quality Indicators (IQIs) reflect quality of care inside hospitals and include:

- Inpatient mortality for medical conditions
- Inpatient mortality for surgical procedures
- Utilization of procedures for which there are questions of overuse, underuse, or misuse
- Volume of procedures for which there is evidence that a higher volume of procedures maybe associated with lower mortality

Patient Safety Indicators (PSIs) also reflect quality of care inside hospitals, but focus on potentially avoidable complications and iatrogenic events

Box 2. Using the PSIs for Improvement – An Example from Wisconsin

Covenant Healthcare System, Inc. in Milwaukee, WI, reports that they are using the AHRQ QIs in several ways. First, Covenant runs the IQIs and the PSIs on their internal as well as state data. The PSIs are used to identify areas for quality improvement efforts in Covenant's hospitals. Examples of patient safety projects underway include fall reduction, medication error reduction, elimination of dangerous abbreviations, and reducing risks associated with surgery.

Carol Munsch, the Regional Director, Clinical Data Dept. at Covenant, also finds the AHRQ QIs very helpful in preparing to apply for the American Nurses Association Magnet Center status. Applicants for Magnet designation must collect data and report on specific nurse-sensitive quality indicators at the unit level. Although the Association provides a list of indicators, they do not define the indicators. Covenant found it helpful to apply the definitions of AHRQ PSIs and IQIs that overlap the Association's list of indicators.

Covenant Health Care system is part of Wheaton Franciscan Services, the parent organization for health and shelter service organizations sponsored in four states by the Wheaton Franciscan Sisters. Wheaton has selected some of the PSIs and some of the IQIs to identify opportunities for clinical improvement and process improvement. The AHRQ indicators are consistent and provide a portable way to use measures across the entire region.

nationally representative examination of patient safety ever undertaken in the US and the 2004 NHQR expanded upon this analysis.[7] The 2004 NHQR assessed patient safety in three areas:

- hospital-acquired (nosocomial) infections
- adverse events and postoperative complications of care using the AHRQ PSIs
- inappropriate use of medications by the elderly

The results reported on adverse events and postoperative complications of care focused on one particular PSI, specifically a foreign body left in during a procedure. The results as they were presented in the report are listed below.

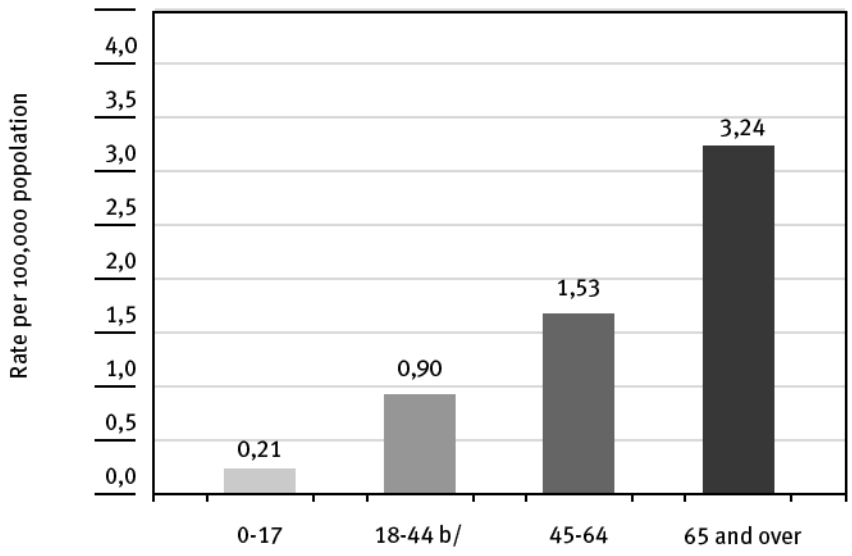
The Figure 1 shows that about 1 case of foreign body left in after procedure, either retained during current hospitalization or a previous hospitalization, was discovered in every 100,000 persons in 2001, declining from 1.4 per 100,000 population in 1994 (HCUP 1994-2001). In addition, foreign bodies left in after procedure were more likely to be detected in elderly patients.

The Limitations of the AHRQ PSIs

The primary limitation of the AHRQ PSIs and the Quality Indicators as a whole is in the nature of their data source – administrative or discharge data.

Figure 1. Prevalence of foreign body left in during procedure, by age, 2001

Source: Agency for Healthcare Research and Quality, HCUP Nationwide Inpatient Sample. 2001.



Note: Boldface rate is statistically different from b/; adjusted by gender.

The AHRQ QIs are designed to be clinically specific measures of health care quality, however, their data source, administrative data, was not designed to assess clinical performance, but rather to facilitate administrative tasks such as patient billing. AHRQ cautions potential users of the PSIs and the QIs generally to consider limitations associated with the use of administrative data, risk adjustment capabilities, the potential impact of variations in coding practices (such as the reporting of E-codes), and potential impact of practice patterns (such as the tendency to perform a procedure in an outpatient setting). Decisions on how and whether to use the AHRQ QIs or any other measure set is a local matter and depends on various local issues such as data availability and data quality, legislative mandates, confidentiality issues and data use agreement, and resources to name a few. In addition, users may wish to carefully consider the presentation of results to avoid potential confusion and over-interpretation of indicator results. AHRQ will continue to provide evidence that will inform and further clarify hospital specific public reporting issues.

Next Steps - Refining and Expanding the Indicators

AHRQ is currently engaged in a number of initiatives that will enhance the PQIs in particular and the AHRQ QIs as a whole. The first initiative is a pilot project to add additional clinical information. This project will examine the cost and benefit – in terms of increased specificity and sensitivity of the indicators – of adding a set of targeted clinical information to the administrative health care record.

A second initiative that AHRQ is undertaking is the development of a new Pediatric Quality Indicators (Pediatric QIs) module that will adapt indicators from all three QI modules—the PQIs, the IQIs and the PSIs. As use of the AHRQ QIs increased, researchers, hospitals, state data organizations, and others began to evaluate their potential use in the pediatric population. Children are different than adults because of relatively low mortality and morbidity rates, specialized pediatric services (e.g., neonatal intensive care units and children's hospitals), rapid physical and mental development over a wide age range, and dependence on adults for access to care. In addition, some ICD-9-CM and DRG codes are specific to children of particular ages, and others used for adults may have a different clinical interpretation when applied to the pediatric population.

To initiate the development of the Pediatric QIs module, the AHRQ's QI team reviewed the current AHRQ QIs for applicability to the pediatric population and found that not all current indicators could be considered for inclusion in this new module. Four clinician panels were convened to evaluate the face validity of the AHRQ QIs as applied specifically to a pediatric population. During the evaluation, panelists emphasized several themes that differentiated the pediatric indicators from their adult counterparts:

- **Face validity** – Because of the sparse literature on pediatric quality indicators, the QI team relied heavily on expert clinical consensus during indicator development and evaluation. Panelists frequently suggested modifications that required data elements not available on discharge data used in the AHRQ QIs. The panel's rigor was reflected in their assessments of the indicators.
- **Complications in high-risk groups** – The panelists noted that the indicators were of greater value for quality improvement when including high-risk pediatric populations, and indicated a preference for analysis using stratification by risk category rather then exclusion. In the adult population, high-risk populations are generally excluded to improve the heterogeneity of the population.
- **Precision and bias** – Including high-risk populations introduces a potential source of bias when comparing rates among hospitals or demographic groups. Risk adjustment partially addresses this problem; however, the high-risk cases in pediatric populations tend to be concentrated in children's specialty hospitals. Another approach is to create separate indicators by risk category; however the high risk-cases are rare in the pediatric population and the resulting indicators are potentially imprecise.
- **Use and interpretation** – Panelists were supportive of the use of the indicators for interval quality improvement, including case finding and trending of provider performance over time. The panelists were more reserved in their recommendations for use in comparative reporting, highlighting the issues noted above concerning face validity, precision, and bias. [8]

Future development of the Pediatric Quality Indicator module will incorporate new indicators that have been identified through literature review and consultation with national organizations involved in quality of care for children, including federal agencies, advocacy groups, and professional organizations.

Perhaps even more important than the above initiatives to improve the clinical specificity of the AHRQ PSIs and to expand their application to other patient groups like children is the possibility of the use of the AHRQ PSIs in the international setting.

The Organization for Economic Cooperation and Development (OECD) maintains an ongoing project on Health Care Quality Indicators (HCQI) whose goal is to develop a set of quality indicators that can be used to reliably assess quality of care across countries and raise questions about differences in quality of care internationally. An 'Initial List' of 17 indicators has been identified which appear to meet certain standards in terms of their importance for informing policy and their scientific soundness, and for which it was believed that data was widely available across the 23 countries currently taking part in the study. These indicators constitute a subset of indicator lists compiled through two previous international collaborations. (These two collaborations were, respectively, among the 'Commonwealth Fund' Group of countries - Australia, Canada, New Zealand, the United Kingdom and the United States - and the Nordic Group of countries - Denmark, Finland, Iceland, Norway and Sweden).

In order to build on this initial set of indicators, which was devised somewhat opportunistically, the OECD asked HCQI participating countries to rate their priority areas for development of quality indicators. The result of this priority setting was consensus on five additional areas of indicators, one of which is patient safety. For these priority areas, expert panels were appointed and a review of the literature on the scientific soundness and clinical and policy importance for indicators in each of the five areas was completed. In patient safety, 21 indicators were recommended for further work by the OECD. These indicators are listed in Table 1.

From March to November 2005, the OECD gathered information as to the availability of data to support international analysis on patient safety using the above indicators. Out of 21 countries surveyed (two countries participating in the project did not participate in the data availability survey), 14 responded to the questionnaire on data for the patient safety indicators. Relatively few indicators have more than 3 countries that state that they had data was immediately available on an indicator (two exceptions are "Problems with childbirth" where 7 countries have available data and "Birth trauma-injury to neonate" where six countries have data). However, a larger number of countries state that the indicators could be constructed from available data. Over

Table 1. OECD HCQI Patient Safety Indicators

Aspect of care	Measurement area	Measureo
Patient Safety	Hospital-acquired infections	Ventilator pneumonia
		Wound infection
		Decubitus ulcer
	Operative and post-operative complications	Complications of anaesthesia
		Postoperative hip fracture
		Postoperative pulmonary embolism (PE) or deep vein thrombosis (DVT)
		Postoperative sepsis
		Technical difficulty with procedure
	Obstetrics	Birth trauma - injury to neonate
		Obstetric trauma - vaginal delivery
		Obstetric trauma - caesarean section
		Problems with childbirth
	Sentinel events	Transfusion reactions
Diabetes		Lower extremity amputation rates

Table 2. Patient safety indicators with available data*, OECD, 2005

• Infection due to medical care	• Wrong blood type
• Decubitus ulcer	• Wrong site surgery
• Complications of anesthesia	• Foreign body left in during surgery
• Postoperative hip fracture	• Birth trauma-injury to neonate
• Postoperative pulmonary embolism or deep vein thrombosis	• Obstetric trauma-vaginal
	• Obstetric trauma-cesarean
• Technical difficulty with procedure	• Problems with childbirth
• Transfusion reaction	• Patient fall
	• In-hospital hip fracture or fall

* Note – Table lists indicators where half or more OECD HCQI surveyed countries stated that they could supply data or could construct data for the indicator. Note that not all indicators listed are AHRQ PSIs.

half of the countries surveyed stated that they had or could construct from available statistics, data on 16 of the patient safety indicators. These 16 indicators are listed in Table 2.

The breadth of the above list means that testing of the PSIs on other country data systems is an imperative. Work is ongoing though a partnership between AHRQ and the Italian National Observatory on Health in the Italian Regions to test the AHRQ QIs with the Italian national hospital discharge data set. Preliminary results indicate that many of the operational issues associated with differences in coding schemes and data set structure are surmountable. Moreover, additional testing of the AHRQ QIs as applied to Italian hospital data has been done through the Italian National Indicators Project, with good sensitivity and specificity reported for many indicators, although this varied according to the indicator.

Conclusions

It is clear that there is vast, and growing interest in the area of patient safety. However, the political and scientific attention has to date not resulted in widespread concrete efforts to assess the level of the problem. At present, we are unable to report whether, in the six years since the release of the Institute of Medicine's *To Err is Human* whether health care systems in the US or elsewhere in the world are actually safer for our patients. While progress has been made in specific interventions, improvement of the magnitude called for by the Institute of Medicine is still untraceable. [9] The data systems needed to track patient safety over time and our interventions to improve it, have not yet been put in place. More work is needed at national and international levels in order to address this gap in our knowledge. One promising area for development and application in other settings of care are the AHRQ PSIs. With additional refinements on their clinical specificity, with more stability in their definitions over time to permit long-term monitoring and with country interest within organizations such as the OECD to build on the existing scientific work on these indicators, the ability of these indicators to help answer questions about patient safety worldwide will be significantly enhanced.

"The views expressed in this article are those of the authors and do not necessarily reflect those of the Organization for Economic Cooperation and Development, the Agency for Healthcare Research and Quality or the U.S. Department of Health and Human Services."

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