Private Practice Outcomes

Validated Outcomes Data Collection in Private Practice

Jack Goldstein MD

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Abstract

Background Improved patient care is related to validated outcome measures requiring the collection of three distinct data types: (1) demographics; (2) patient outcome measures; and (3) physician treatment. Previous impediments to widespread data collection have been: cost, office disruption, personnel requirements, physician motivation, data integration, and security. There are currently few means to collect data to be used for collaborative analysis.

Questions/purposes We therefore developed an inexpensive, patient-centric mechanism to reduce redundant data entry, limiting cost and personnel requirements.

Methods Using an intuitive touch-screen kiosk interface program, all data elements have been captured in a private practice setting since 2000. Developed for small to medium sized offices, this is scalable to larger organizations. Questionnaire navigation is patient driven, with demographics shared with EMR and billing systems. Integration of billing and EMR with outcomes minimizes cost and personnel time. Data are deidentified locally and may be centrally shared. Since data are entered by the patients, minimal personnel costs are incurred. Physician disincentives are minimized with cost reduction, time savings and ease of use.

Results To date, we have collected high level data on most total joint patients, with excellent patient compliance.

Conclusions By addressing impediments to broad application, we may enable widespread local data collection in all practice settings. Data may be shared centrally, allowing comparative effectiveness research to become a reality. Future success will require broad physician participation, uniformity of data collected, and designation of a central site for receipt of data and its collaborative comparative analysis.

Introduction

First suggested by Codman in 1924 [5], and championed by Swiontkoski [16], medical outcomes data collection has been recognized as a vital means for improving patient care. From clinical observation to randomized controlled studies, all outcome evaluations have an important role in improving care and quality through feedback on clinical decision making [2]. The collection of outcomes data is the only accurate way of determining the effectiveness of individual treatments. This information ultimately affects cost. High quality medical evidence enables us to rapidly answer questions about which treatments best address common problems, and which are ineffectual or do not work as well [11]. Practice standards can then be based upon up to date comparative effectiveness research determining best patient outcomes.

Dedication to continuous, quality improvement serves to enhance our credibility with the public and empower us. Knowledge is power. Physicians alone have access to the most valuable patient data [9].

To date, widespread data collection has been primarily limited to registries [7], even in the European countries

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The author certifies that this study was utilized for internal office use, and that all investigations were conducted in conformity with ethical principles of research.

J. Goldstein (✉)

Department of Orthopaedic Surgery, Miriam Hospital, Sports Medicine, Orthopaedics and Podiatry, Brown University, 400 Massasoit Avenue, Suite 200, East Providence, RI 02914, USA

e-mail: jdgoldstein@automationmed.com

most experienced with it. While registries yield important information, they only reflect physician treatment and not patient measured outcomes. Registries are related to case series (Level 4 data) [13] submitted to a central repository by surgeons to identify potential problems at an early stage regarding implants [10]. This is effective, but only a fraction of medical evidence that reflects ultimate patient outcome.

Validated measures have been increasingly used in the literature to document patient treatment success [3]. These are generally reports of small series or limited to physician groups. Unfortunately, there is currently no inexpensive mechanism which integrates local demographics and Validated Outcomes Measures to collect data from patients and doctors for wide area analysis.

Data collection is problematic due to additional office costs, disruption of office flow, and added personnel requirements. Security concerns, uniformity of data collected and a means for widespread data integration [19] also present substantial challenges. Notably, the highest percentage of orthopaedic surgeons can be found in solo, small, and mid-sized groups. This was demonstrated in the 2008 Orthopaedic Census where it was found academic surgeons represented only 8.5% of all orthopaedic surgeons. In addition, the financial and institutional barriers faced by the orthopaedic clinical-scientist have made the endeavor much harder, limiting enthusiasm for others to participate [15]. For outcomes data to be meaningful, solo physicians and those in small groups should be included [17].

Our goal is to develop an inexpensive mechanism to encourage widespread validated outcomes data collection without disruption of office flow or added personnel, enabling broad applicability in all clinical settings.

Practical Data Collection

Much has been written about evidence-based medicine and how it should be performed [1], yet there is little practical advice on how this can be accomplished given the associated financial and physical impediments. The necessary components for outcomes data collection, including patient demographics, patient outcome measures, and physician treatment data, are often in separate office systems, making comprehensive data collection expensive and difficult. These components should be integrated to decrease duplicate data entry and attendant cost. Measures also need to be collected uniformly between sites to allow integrated data collection and reporting [3].

Pay for performance initiatives may make data collection reimbursable, but physicians need to lead data collection and integration efforts. Government mandates are likely to force physicians to spend time and money on

data collection that has little effect on the improvement of care or cost.

In the mid 1990s, the American Academy of Orthopaedic Surgeons tried to collect patient outcomes data with multiple member involvement in the MODEMS project, because “critical evaluation of the results of treatment is one of the most important and most effective methods of improving medical care” [17]. The project was forward thinking, but was dropped because of difficulties in collecting data, securing costs, and a lack of member interest [16]. At that time, no good mechanism was available for data collection at low cost with minimal office involvement or interference with patient flow. This prompted our development of a data collection mechanism that addresses current problems.

Data Collection Strategy

Using my own practice as a beta site and with the goal of addressing previous impediments to ongoing data collection, a program was developed which resolved the major issues and disincentives to data collection. This began with a partnership with a programming team to improve data collection mechanisms, which would allow lower office costs, address security concerns, and also allow multiple site data collection. This resulted in a solution with integration between disparate office systems; allowing for office streamlining through automated data collection. Well-designed, electronic data collection is accurate and reflects paper form entry, while reducing errors, and allowing all patients to participate [12, 18]. This also allows for criteria based navigation, which can simplify and improve the patient experience [8]. Screens use a simple interface [6] with an answer to each question required for progression, large buttons, and audio/visual feedback. In this way, improved data collection eliminates duplicate data entry, ensures completed questionnaires and provides added functionality including patient educational content with multimedia and print features (Fig. 1). Upon completion, questionnaires are automatically scored, graphed, and displayed for patient feedback incentivizing ongoing participation. Touch-screen kiosk or tablet computers connect to other database applications and a file server for secure redundant data backup. Data collection occurs without added personnel or recurrent cost, and required data entry per screen assures complete data entry. Even the elderly with poor vision or hand tremor can easily navigate and complete the appropriate questionnaire. Automated navigation guides the patient to the correct outcome measures with a few simple questions (Fig. 2).

This outcomes data collection system may connect to billing, EMR, and radiograph databases. Outcome experts

Fig. 1 The patient interface screen is simple and intuitive for ease of direct patient input.

have stated that a specific research question is needed before collecting data [4], but without an effective means to collect data easily, at a low cost, and without office disruption, research questions cannot be addressed. This platform may be customized to build direct patient and physician data input with a generic form designer, rapidly creating working questionnaires complete with scoring, and criteria-based navigation for computer adaptive testing when enough data are collected to statistically validate the navigation [18]. We are able to directly populate patient demographics and medical history, with the potential of integrating validated outcomes data into electronic medical records. The process eliminates paper forms and secondary data entry, improving data collection while lowering office overhead. Simple physician data input minimizes the physician burden, allowing complications, procedure, and procedure specifics to be linked to patient data.

This was formulated utilizing the Norwegian registry as a model (Havelin LI, personal communication, 2004) and patient scores are easily viewed from the physician interface. Data may be stored in any modern secure database.

I suggest only validated outcome measures be collected, including both generic and disease specific outcome instruments as suggested in the design of clinical studies [10]. After initially using the SF-36, I converted to the SFMFA because of improved sensitivity and specificity to orthopaedic outcomes, as well as joint specific measure data collection.

Issues with Web Based Data Collection

I initially collected data on a patient computer kiosk in a web environment. During the first year, I encountered several challenges that led my programmers and me to rethink the Web approach. I realized that maintaining a

Web environment was difficult and expensive and addressing HIPAA and security concerns added unnecessary complexity and cost to the office.

Web interfaces are restricted by the interaction between the host and remote machine, and the interface is not intuitive, especially for elderly patients. Web-based data collection is inherently biased by the availability and ease of use of the interface, and a loss of internet connection results in data loss. Form submissions often allow multiple questions per page and there is no requirement for all to be answered. This allows for incomplete data entry and errors that confuse patients. These issues have been partly addressed with the advent of Web 2.0 and features that can be integrated using AJAX. Concerns over centrally housed identifiers, and recurrent cost required to input patient demographics continue to plague Web-based systems. The benefits of a local system include: (1) simplified security with no patient identifiers in any database other than that used for local billing or EMR; (2) reduced cost with shared demographic data entered locally, sparing reentry on a central system; (3) automated navigation using local identifiers and treatment history. This is difficult to achieve on the Web without duplicating all identities and history. Local data retrieval and analysis is simple when the data reside locally, and the local environment is feature rich with audio and video and may be customized to an individual practice. In addition, integration of physician input including procedure, technique, prosthesis, and complications, is simpler, quicker, and less cumbersome than in a Web-based system. The only drawback to local data storage is that data cannot be input from home.

While Web-based systems are portable and scalable there is little or no difference in hardware costs between local and Web-based data collection. The cost of inputting demographic data on patients to a central site is recurrent and unending, while the cost of local data collection for a practice is a one-time initial cost. This could be dramatically decreased by standardization.

A large amount of data may be transferred without the identification of patient or physician, eliminating security concerns. The time to fill out each form is identical to that of a paper-based system, but the nature of the interface (Fig. 3) requires that every question be answered, eliminating incomplete data. Validated outcome measures then include a comprehensive record including patient treatment, diagnosis, and demographics.

Local Security

The patient kiosk data entry system may be integrated with Legacy (ie, Medical Manager®, Sage, Tampa, FL) or modern billing systems so that demographic data is utilized

Fig. 2 Customized, automated patient navigation allows patients to input data with minimal office intervention.

for secure patient log on without office personnel involvement. Patients log on using their last name and a security identifier (ie, the last four digits of their social security number) as a password for HIPAA compliant entry. While in a Web-based system all direct patient identifiers would have to be removed to conform to HIPAA guidelines, these identifiers can be simple table unique identifiers when performed locally. In addition, the patient name is only used to aid patient direct login. The data input side cannot access any data, and patients are only able to add new data to their own record.

Patients navigate to the correct questionnaire based upon a simple body graphic navigation using large buttons on a touch screen monitor. Return followup visits are automated using internal callback, and the patient is recognized by logging on and is given the appropriate form without

navigation (Fig. 2). Even for private practices that still utilize paper-based medical records, patients may enter their own name and password identifier with basic demographic information, still allowing automated call-back. While Web-based storage of HIPAA compliant patient records might seem cost-effective, local storage is simpler and easier to house and maintain. One has to remember that the cost of security is not insubstantial in a Web-based system, and is always open to scrutiny. Individuals and small groups are held to the same security standard as large groups.

Scoring Graphing and Data Mining

Local administrative features allow physicians to query, score, and graph their own data locally by CPT, patient, age,

Fig. 3 All question types from Validated Outcomes Measures are available including Scales.

sex, date of surgery, outcomes instrument, and system (Fig. 4A). Data from many proprietary systems are difficult to share; so we purposely created an open data architecture that could be easily integrated with other data collection systems. Data may be exported to EMR via XML (Extensible Markup Language) for integration. Our data analysis utilizes SQL (Structured Query Language) queries to enable rapid customization of scored and graphed parameters [14] (Fig. 4B). The common problem encountered with different databases with minor additions of new questions is addressed by storing all data in both an outcomes database and a detailed outcomes database. In the latter, all queries can be made by individual question or questionnaire, eliminating the issue of incomparable databases. Furthermore, a detailed database allows examination of any combination of questions. This could be useful when examining specific

Fig. 4A–B (A) Local Data can be queried by common parameters such as CPT, System, Date Range, and Questionnaire. (B) The resulting graph following calculation (mean and standard deviation in this case) for the population queried above, is viewed with overlying individual patient values.

question sets or ignoring a “new question” so that old and new data can be evaluated as a single data set.

Results

I initially collected data only on total joints as suggested by the AAOS Special Interest Group on Outcomes Data Collection [Haralson, Robert AAOS Special Interest Group, 2001]. Although I have added other data collection since its inception, most has been total joint information because of the relative ease of collection and reliability of the patient population.

Since 2001, I have collected complete data on 2777 unique visits, for 460 unique patients. Of these, there were 32 total shoulders, 17 right and 15 left; 240 hips, 125 right and 115 left; and 443 knees, 227 right and 216 left. Five hundred and fifty-four baseline visits were obtained and 2223 follow up visits, with an average of five follow up visits per joint performed. Return visits were at 6 weeks, 6 months, and yearly intervals following surgery. Call-back intervals may be easily adjusted as desired.

Since its inception, several other groups have expressed interest in utilizing our system.

Discussion

Currently, despite the importance of outcomes measures, wide area data collection is difficult to obtain because of cost, office personnel requirements, and physician motivation. We have developed a means to collect data by linking to native billing or EMR systems to limit redundant

data input and cost, and allow patients to easily input their data directly.

Even with a fully-automated mechanism that minimizes office interaction, the office culture must change to ensure that every patient in the office who should be entering data is encouraged to do so. This requires diligence from the office intake, strong physician direction, and patient education.

The addition of physicians and physician groups is essential to create widespread data collection, viable comparative effectiveness and empower physicians to evaluate data from sites and sources.

Consensus on standardized validated outcome measures used across physicians and groups is essential to allow this. I realize that data collection efforts by others may parallel our efforts. We have created a versatile open data structure that allows us to integrate our data with others. Proprietary data structures limit efforts to integrate widespread data collection. Unlike what the AAOS had set up in the 1990s, we can store data with little security concern. Instead of holding and securing sensitive data, local unique table identifiers link patients and data, with no patient identifiers utilized,

Because all of the forms are standardized validated measures, the data are meaningless without a key to their use or patient identifiers. Score files are small tables of numbers, and consist of Questionnaire name\patient number\site number\doctor number\question number\question value. In this way, the data is sent in an encrypted format. We envision an automated mechanism to return national benchmark values when data are submitted. This would allow physicians to locally evaluate their patients relative to the standard without concern of oversight.

Previous impediments to practical data collection have been achieved while lowering office overhead, and limiting personnel requirements in our own practice setting [16]. This is provided with local data security, local data scoring, patient recall, and a means to transport unidentified data with additional local or Web-based educational content.

Office automation systems can potentially integrate disparate office systems and lower office overhead by eliminating duplicate data entry. Valuable data may be collected without further cost while augmenting patient education. Such systems require simplicity and ease of use for patients and physicians alike, and should not require high level IT personnel to install or maintain.

What we have developed is scalable for widespread data collection efforts and multiple site integration, and could provide a means for private practices to become intimately involved in outcomes research without excessive time or cost burdens. The driving force has been an integration of practical quality data collection in every practice setting, collected locally and shared nationally, allowing comparative effectiveness research and evidence based medicine to become a reality.

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