

A Technology Solution for the High-Tech Diagnostic Imaging Conundrum

Leif I. Solberg, MD; Cally Vinz, MBA, RN; and Jim E. Trevis, BA

The combination of highest costs and lowest performance on many measures of population health compared with most other developed countries has US policy makers searching for anything that might affect both trends.^{1,4} One of the largest drivers of cost increases appears to be the rapidly expanding use of expensive high-tech diagnostic imaging (HTDI) procedures: computed tomography (CT), magnetic resonance imaging (MRI), and positron emission tomography (PET). The Medicare Payment Advisory Commission recently reported to Congress that these tests increased at a rate of 7.2% a year per Medicare beneficiary from 2003 to 2008.⁵ Moreover, the General Accounting Office found that from 2000 to 2006, Medicare Part B spending on CT scans, MRIs, and nuclear medicine rose at 17% annually.

Mitchell used data from a large private insurer in California to show even greater increases in MRI and CT (50%) and PET (400%) scans from 2000 to 2004 among the commercially insured.⁶ Even a large integrated health system was not immune to such increases. From 1997 to 2006, the CT volume doubled and MRIs tripled, while the annual cost of radiology imaging per enrollee increased more than 2-fold.⁷

Unlike the usual problem of delayed translation of innovations into practice, advanced imaging growth has occurred in the absence of much evidence about its effectiveness, appropriate use, or impact on care, patient outcomes, and costs. In addition, CT is associated with increased radiation exposure, combined with large variations for individual procedures and a paucity of good data to guide users in selecting exposures.^{8,9}

Finally, there is increasing evidence that these procedures are so much better at identifying potential abnormalities than previous methods that incidental findings are very common, perhaps leading to additional unnecessary care and risks for many patients.^{10,11} The American College of Cardiology (ACC), the American College of Radiology (ACR), and others have developed appropriateness criteria for many of these procedures, but they are largely based on expert opinion due to the scarcity of evidence.^{12,13}

In an effort to address this conundrum by ensuring that appropriate high-tech scans are ordered while controlling potentially excessive use and costs, health plans and Medicare intermediaries around the country have

implemented a variety of prior authorization and prior notification programs, often through contracts with radiology benefits management companies.¹⁴ Physicians have

Objectives: (1) To describe a unique initiative to implement a standardized system of electronic decision support for ambulatory orders for high-tech diagnostic imaging (HTDI) statewide, and (2) to evaluate the impact of a pilot version of that system, plus prior notification on the volume of such orders.

Study Design: Description of the initiative and analysis of aggregated claims data.

Methods: Claims data for HTDI studies were aggregated from the main health plans in the state from 2003 to 2010 by the regional quality improvement collaborative that also facilitated the pilot and subsequent initiative being implemented in 2011 throughout Minnesota.

Results: Aggregate ambulatory statewide orders for HTDI tests increased from 32 to 41 per 1000 members from 2003 to 2006 (9% per year) at which point the rate leveled off through 2010. This trajectory change was simultaneous with implementation of an electronic medical record-based decision-support system for all ambulatory HTDI orders from 45% of the physicians in the state, as well as a prior notification/authorization approach by payers for the rest of the HTDI orders.

Conclusions: Although it is not possible to disentangle the effects of these separate approaches, the much greater physician acceptance of the decision-support system has led payers to financially support the creation of a unique statewide implementation of a version of this system to replace prior notification/authorization approaches.

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Take-Away Points

A Minnesota collaborative effort among payers, providers, and patients has studied high-tech diagnostic imaging (HTDI) tests and is implementing a solution that will create a common electronic, point-of-order, decision-support ordering and reporting system used by nearly all clinicians in the state. We have learned:

- HTDI test rates were increasing at 9% per year until 2006, when a combination of payer prior notification/authorization systems and a pilot version of the proposed decision-support system stopped further increases.
- Payers will cover the costs of such a system with the savings in reduced ordering rates and lower administration costs compared with using prior notification/authorization.
- All stakeholders—patients, providers, payers, and employers—see advantages in the proposed system.

been critical of these efforts because they create care and administrative inefficiencies, and because the rules under which they operate are often opaque, even those that rely on professional guidelines. Congress made Medicare back down on a national program to require such programs.¹⁵

A COLLABORATIVE APPROACH TO THE PROBLEM

Insurers in Minnesota were facing the same rapid escalation in use and costs of these HTDI procedures, with increases of 9% annually from 2003 to 2006. Therefore, in 2007, several Minnesota health plans launched prior notification programs at the same time as the Minnesota Department of Human Services (MN DHS) instituted a prior authorization program for public program recipients. This led to numerous complaints from doctors about the time and delays required to comply with these requirements. As a result, payers and providers came together to explore alternative solutions to the HTDI conundrum. With facilitation by the regional quality improvement collaborative (Institute for Clinical Systems Improvement [ICSII]), they formed a steering committee with the following goals:

1. Pilot a point-of-order decision-support alternative to multiple prior notification/authorization requirements in medical groups able to use it in their electronic medical records (EMRs).
2. Aggregate claims data from all the major payers and MN DHS to monitor utilization rates of HTDI procedures over time.
3. Explore long-term solutions to improve both the value of appropriateness criteria and adherence to those criteria.

Five large medical groups with more than 6000 physicians volunteered to participate in the pilot. Four of them used the same EMR platform, so they could adapt and implement the decision-support system created by 1 group, based

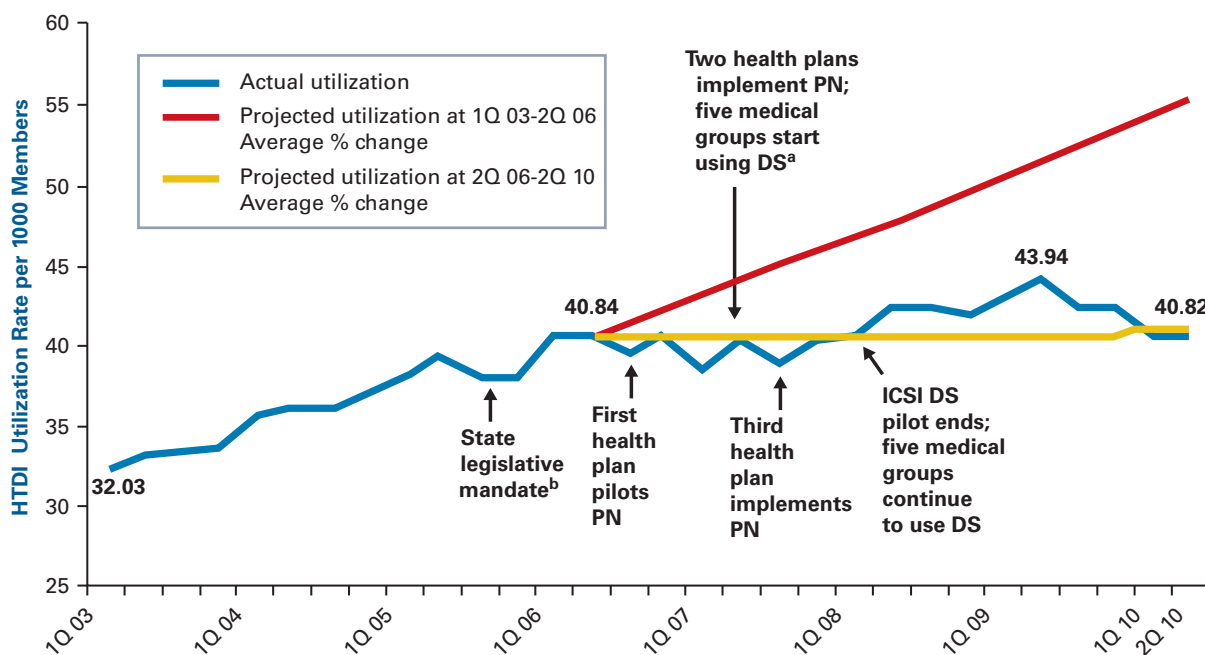
on criteria from ACR and ACC. These 4 organizations used the decision support in the examination room at the point of order. The fifth medical group purchased a decision-support solution from a vendor. The physician leaders of each pilot group reported that the use of decision support was much more efficient, patient-centered, and clinician-supportive than having to call in orders for external review.

In order to evaluate the impact of this pilot decision-support system, a study was conducted that audited 300 randomly selected charts of patients with a head CT, head MRI, or spine MRI, one-half 6 months before and one-half 6 months after implementation of the new decision-support system in 1 of the pilot medical groups.¹⁶ This study showed that the proportion of these orders fitting the appropriateness criteria increased from 79% to 89% after implementation of the computer decision support, but demonstrated no change in the frequency of positive findings or apparent impact on patients. It also demonstrated a 20% and 36% drop in orders for spine MRI and head CT, respectively, but no change in orders for head MRI, suggesting differential impacts on different procedures and indications.

Meanwhile, the collaborative's aggregation of claims data for ambulatory HTDI orders from 5 health plans and MN DHS demonstrated a plateau in total orders starting from the time these changes were taking place. The **Figure** shows both actual aggregate procedures and a projection of what the rate would have been if the previous rate of increase had been sustained, along with when key changes occurred. We estimate that the difference between the 2 lines reflects a savings in healthcare costs of approximately \$84 million from 2007 through 2009 from the combined implementation of prior notification and decision support. This is about 11% of total spending on HTDI tests during that time period. In addition, the pilot medical groups have saved additional costs by avoiding the requirement for telephone call reports. One of them reported spending 308 hours to get approval on 1850 HTDI scans in 1 month in the pre-EMR system, an average of 10 minutes per order. Using decision support, it currently takes approximately 10 seconds per order, for a time savings per month of approximately 300 hours for the 1 organization.

It seems likely that any effect on HTDI procedure rates was the result of some combination of the payers' prior notification/authorization programs and the computer decision support for orders in the EMRs of the 5 medical groups. In 2007, these 5 groups accounted for approximately 45% of the HTDI claims submitted to the payers. Although we have no way to

■ **Figure.** Aggregate HTDI Utilization Rate per 1000 Members From the 4 Main Health Plans and the Minnesota Department of Human Services, First Quarter 2003 Through Second Quarter 2010



DS indicates decision support; HTDI, high-tech diagnostic imaging; ICSI, Institute for Clinical Systems Improvement; PN, prior notification; Q, quarter.

^aMembership profile differs across health plans.

^bOnly members affected by the health plan's HTDI initiative are included in this analysis.

Note: Aggregate data include: BCBS, HealthPartners, Medica, UCare, and DHS claims and membership data (hospital inpatient and emergency department claims excluded).

separate these effects on order rates, Medicare data from 1 payer for 1 large group using the decision-support approach found a decrease of 12.5% from 2006 to 2008. We also know that 1 major payer never implemented prior notification/authorization processes, whereas 2 others phased out their use as more and more medical groups implemented some version of decision support. Therefore, the plateau demonstrated in the Figure has been sustained without much use of prior authorization/notification.

A UNIQUE STATEWIDE SOLUTION FOR THE FUTURE

This success reassured both provider groups and payers that we could do something about this challenge by working together. All agreed that the best approach was to spread the point-of-order decision-support system, ideally through the normal channel of ordering important procedures, so that both clinicians and patients could learn and enhance shared decision making. After a rigorous effort to compare various vendor options, the steering committee found a single vendor who would design a system and a common set of appropriateness criteria

usable by everyone in the state, regardless of having an EMR.

Four nonprofit health plans and MN DHS agreed to cover the entire cost of the system, in proportion to use for their members. Moreover, this option would be offered without charging medical groups for their patients who have other forms of insurance (including Medicare, which declined requests to participate) and the uninsured. The payers did this because the aggregate data convinced them that the cost savings from the decision-support option would be both patient-centered and cost-effective.

The common set of appropriateness criteria, based on ACR and other specialty associations' guidelines, will be usable in an integrated way within most EMRs, while clinics without EMRs can access the same ordering system and appropriateness criteria through a secure website. The only costs for users will be for EMR modifications or computer access and a data feed. Radiology groups will do the same to submit reports.

Participating payers will also submit their member and provider information into the system, so users will need to do minimal entry of demographic information. Organizations that participated in the decision-support pilot have continued using it and will now use the new option arranged through this

collaborative. Each participant will have access to its own organization's data through standardized reports of ordering patterns and adherence to criteria. For a complete description of this solution, see http://www.icsi.org/health_care_redesign_/diagnostic_imaging_35952/.

In addition, the steering committee established an evaluation group that will use de-identified and confidential aggregate data from the entire system for:

1. Collective updating and expansion of the appropriateness criteria in collaboration with the vendor and appropriateness criteria developers.
2. Analysis of the impacts of the criteria on patients, patient care, and costs of care.
3. Feedback on comparative results to individual provider groups so that they can improve their ordering patterns.
4. Development of research projects that will even further increase the understanding, use, and value of HTDI procedures while reducing low-value tests and radiation risks.

At this time, the contracts have all been signed with the payers, and both ordering and rendering provider groups are signing up. We expect that at least 80% of Minnesota physicians will be using this system within the next year. The advantage for ordering providers is not only to avoid the burden of a prior authorization/notification process for ordering these tests, but to have real-time information about which tests are most useful. As the clinician goes through the ordering process, putting in indications from the patient assessment, a utility score from 1 to 9 is fed back. If the score is low for the proposed procedure, the clinician can still order it (the system is designed to incorporate each participating health plan's individual procedures for ordering lower-utility scans), but alternatives of higher utility (including ultrasound, plain x-rays, or none) are provided to encourage more appropriate care. Moreover, the screen information can be shared with the patient to facilitate a shared decision-making discussion.

Based on the pilot experience with 6000 providers in 5 medical groups, we anticipate Minnesota clinicians and patients will experience the following benefits from using the decision-support approach:

1. Improved appropriateness of HTDI orders.
2. Decreased total orders with associated substantial savings in healthcare costs.
3. Reduction in patient exposure to unnecessary radiation.

4. Increased efficiency in ordering and receiving reports.
5. Greater opportunities for shared decision making.
6. Assistance for provider groups in meeting national expectations for meaningful use of health information technology.
7. Improved patient satisfaction.

CONCLUSIONS

One important question is whether this type of solution could be replicated elsewhere. Although we have a culture that fosters collaboration and an organizational vehicle (ICSI) that is trusted to facilitate it, there are a growing number of such resources elsewhere. For example, the Network for Regional Healthcare Improvement (NRHI) now has more than 50 member- and regional-health improvement collaboratives across the United States and Canada. Others are developing to work on quality improvement and/or public reporting of quality measures. Payers and employers nationally have a strong financial incentive to encourage the development of decision-support systems such as this, and more research is needed to further assess both the impact on patients and return on investment.

Clearly the successful development of this process in Minnesota has given an important boost to further multistakeholder collaborations, and these hold great promise for finally finding a pathway to the triple aim for at least 1 large component of healthcare.

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Author Affiliations: From HealthPartners Research Foundation (LIS), Minneapolis, MN; Institute for Clinical Systems Improvement (CV, JET), Minneapolis, MN.

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Address correspondence to: Leif I. Solberg, MD, HealthPartners Research Foundation, PO Box 1524, MS 21111R, Minneapolis, MN 55440-1524. E-mail: leif.i.solberg@healthpartners.com.

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