# Utilization Management in Radiology, Part 1: Rationale, History, and Current Status

Richard Duszak Jr, MD[a,b], Jonathan W. Berlin, MD, MBA[c]

Previous growth in the utilization of medical imaging has led to numerous efforts to reduce associated spending. Although these have historically been directed toward unit cost reductions, recent interest has emerged by various stakeholders in curbing inappropriate utilization. Radiology benefits managers have widespread market penetration and have been promoted largely by the payer community as effective mechanisms to curb increases in imaging volume. The provider community has tended to favor real-time order entry decision support systems. These have demonstrated comparable effectiveness to radiology benefits managers in early projects but currently have only limited market penetration. In this first of a two-part series, the rationale for the development of utilization management programs will be discussed and their history and current status reviewed.

**Key Words:** Utilization management, benefits management, radiology benefits management companies, computerized physician order entry, decision support

***J Am Coll Radiol 2012;9:694-699.*** ***Copyright © 2012 American College of Radiology***

Dramatic growth in health care spending has resulted in both interest and concern by nearly all enterprise stakeholders. Increases in medical imaging expenditures during the early part of the past decade have attracted specific attention. Various parties are accordingly seeking solutions to manage this growth.

Until recently, efforts to control health care spending have largely focused on unit cost reduction strategies, such as decreased per case reimbursement and bundled payments for medical procedures. The total cost of health care, however, is a function not only of per case payment but also the volume of health care services rendered. Accordingly, payers have increasingly turned their attention to curtailing the amount of health care services provided.

Prevailing models for medical imaging utilization management (UM) currently include radiology benefits managers (RBMs) and computerized physician order entry (CPOE) with real-time decision support (DS) tools. Both models have advantages and disadvantages, which are reviewed in this first of a two-part series. Part 2 will consider these models in the context of more established UM programs in other health care sectors and discuss future challenges and opportunities for practicing radiologists.

## WHY MANAGE UTILIZATION?

Health care spending in the United States is currently on track to exceed 20% of the gross domestic product within the next several years [1], placing it on what many economists and policymakers consider an economically unsustainable trajectory. During the early part of the past decade, spending on medical imaging has risen much faster than that for most other medical services [2]. Although the growth of imaging has since dramatically slowed [3], the incorrect perception of continued volume increases, with associated high costs, has resulted in aggressive initiatives by payers to target medical imaging as part of their cost reduction strategies.

Although medical spending can be quantified in various ways, it is ultimately the simple product of unit price and volume:

$$\text{spending} = \text{price} \times \text{volume}.$$

Strategies to control health care spending, then, typically focus on either price, volume, or both. Historically, most efforts have targeted price. Such unit cost reduction strategies have included ongoing devaluation of physician work through the Resource-Based Relative Value System, reduction in calculated practice expenses, bundling of similar services through new Current Procedural Terminology® codes, and multiple procedure payment discounting [4-6]. Each of these processes can indepen-

[a]Mid-South Imaging and Therapeutics, Memphis, Tennessee.

[b]University of Tennessee Health Science Center, Memphis, Tennessee.

[c]NorthShore University HealthSystem and University of Chicago Pritzker School of Medicine, Evanston, Illinois.

Corresponding author: Richard Duszak Jr, MD, Mid-South Imaging and Therapeutics, 6305 Humphreys Boulevard, Suite 205, Memphis, TN 38120; e-mail: rduszak@duszak.com.



© 2012 American College of Radiology

0091-2182/12/$36.00 • http://dx.doi.org/10.1016/j.jacr.2012.06.010

dently cut price considerably, and in totality, their impact can be quite substantial. It is important to note that such payment reductions are often insidious and gradual and are generally spread across the entirety of a practice's service lines. To that end, their impact on patient access at the individual service level, although difficult to quantify, has likely been limited to this point [7].

In contrast to unit price reductions, efforts to decrease the volume of rendered health care services can translate to identifiable denials at the individual patient service level. These initiatives are based on the belief that one major driver of the expansion of medical imaging is inappropriate utilization, a belief supported by some studies and analyses. The United States has a larger number of CT and MRI units per capita than most other first-world countries [8], but that increased capacity is not necessarily associated with significant improvements in life expectancy [9]. Similarly, regional variation in Medicare per capita spending (which includes imaging) may not always translate to better patient outcomes [10]. When surveyed, a majority of primary care physicians report that, largely because of malpractice concerns, their patients receive too much medical care, and much of that is imaging [11]. Other authors have similarly included various imaging services in their lists of most frequent "unnecessary services" [12] and those that "do not reflect high-value care" [13]. Differentiating inappropriate increases in utilization from situations in which medical imaging has expanded because it has replaced more invasive and costly traditional services [14], however, is challenging.

Unlike unit cost reduction approaches, which essentially ratchet down physician payments, volume reduction tactics are more likely to be perceived as interfering with physician autonomy, expedient patient care, and ultimately the previously unconstrained nature of the physician—patient relationship. Such near real-time scrutiny of medical decision making may challenge, delay, and sometime deny a course of diagnostic inquiry requested by a treating physician. The degree to which such interference occurs, or is perceived to occur, varies considerably between strategies and vendors. Although the goal of most volume management programs is to maximize cost-effective medical care, many such efforts will frequently pejoratively be deemed as rationing care [15]. Nonetheless, as shared savings and value-based purchasing payment models such as accountable care organizations gain increasing traction as alternatives to traditional fee-for-service, UM at the institutional level will likely become increasingly imperative [16]. The current prevailing models for imaging UM—RBMs and CPOE with DS—are reviewed in this article.

No discussion of medical imaging utilization would be complete without mention that physicians with ownership interest in such equipment refer patients for imaging at rates much higher than those who do not [17,18]. Financially driven self-referral has been imputed by some as a driver of inappropriate imaging growth [19,20]. The rationale for this phenomenon and possible solutions have been discussed by those authors, and thus are not detailed herein.

## RADIOLOGY BENEFITS MANAGEMENT SERVICES

Although UM programs have been embraced for several decades by the health insurance industry, imaging-specific initiatives have historically lagged behind, probably related to a relative lack of in-house radiology expertise. The radiology benefits management industry was launched in the mid-1990s to fill this gap, and many insurers have since seized the opportunity to outsource management of their highly specialized—and increasingly expensive—imaging portfolios.

The radiology benefits management industry is currently dominated by relatively few companies with considerably variable regional market penetration. Alphabetically, these include American Imaging Management, CareCore National, HealthHelp, Magellan National Imaging Associates, and MedSolutions. Although early radiology benefits management business models focused on fee-based management service contracts, risk-bearing arrangements have since been embraced by some. In these, an RBM's profitability in individual payer relationships hinges on its success in controlling imaging expenditures.

### Operations

Health insurance company prior authorization processes, particularly as they pertain to elective surgical procedures, are long familiar to most readers. For nonemergent services subject to such requirements, insurer coverage is contingent on certification of medical necessity by a payer before those services are rendered. Failure of a provider or beneficiary to secure preauthorization can result, at least initially and sometimes definitively, in denial of payment.

Certification is determined using payer or contractor coverage guidelines, which are sometimes proprietary and confidential. For imaging services, RBMs' imaging guidelines may parallel the ACR Appropriateness Criteria®, but the lack of transparency with some vendors can create the perception that these are arbitrarily derived.

Preauthorization is typically initiated by a referring physician's administrative staff through an RBM's telephone call center. A large majority of requested procedures are approved at this clerical (ie, staff-to-staff) level [21]. Cases not meeting initial administrative criteria are referred to a nurse at the RBM for further information gathering and review. Cases still not certified at this point are adjudicated through direct "peer-to-peer" communication between the referring physician and a physician at

the RBM. Although at least one RBM claims that its tiered review is an educational process that almost never results in payment denials [21], most others use hard economic stops on services.

### Results of Implementation

Definitive characterization of the impact of RBMs on imaging utilization and its attendant costs is not possible given the proprietary nature of payer claims data. Limited refereed reports, however, demonstrate reductions [22] or slowing [21] in advanced imaging utilization when payers use RBMs. These observations are concordant with the anecdotal reports by many payers to the authors.

Although the radiology benefits management industry probably has contributed to the recent relative slowdown in imaging growth among its affiliated insurers, other payers, such as Medicare, which does not currently use RBMs for its fee-for-service coverage, have also witnessed a temporal and parallel slowdown in the growth of radiology services [3]. One author has attributed this phenomenon to a radiology benefits management sentinel effect [3]. When a physician learns through experience that certain imaging studies will be challenged, that physician's future ordering behavior may become more guarded. Because physicians are unaware of an individual patient's insurance plan at the time they order an imaging study, that behavior persists, and thus the impact of RBMs may become leveraged across all payers.

### Issues and Trends

Tension has long existed between the payer and provider communities surrounding UM, with charges of unnecessary hassles, inappropriate approval wait times, ambiguous and vague requirements, and insufficient medical expertise by decision makers [23]. As a general rule, payers like UM products, and physicians do not. The promulgation of RBMs has led radiology and practice management organizations to promote best-practice guidelines [24], and most criticisms of RBMs have resulted from departures from these standards.

Although reductions in both expenses and risks related to marginally necessary medical imaging is obviously desirous, unnecessarily restrictive radiology benefits management policies can create moral hazards for radiologists advocating patient safety [25]. Additionally, at least some of the cost savings attributed to RBMs may be illusory. Recent economic modeling suggests that some "savings" are simply a shift in costs from insurers to physicians [26]. To that end, the economic impact of RBMs on the health care enterprise as a whole may be less than previously believed.

Time and ongoing investigation will ultimately permit a more complete understanding of both intended and unintended consequences of increasing RBM market expansion. In 2007, an estimated 88 million privately insured Americans were enrolled in radiology benefits management programs [22], and that enrollment has likely grown considerably since. More recently, stakeholders with considerable influence on payment policy have called for the inclusion of radiology benefits management in Medicare fee-for-service coverage [27]. Given these trends and also future opportunities for managing imaging utilization at the institutional or health system level through scalable preauthorization products, continued growth of radiology benefits management could be expected in the future.

## REAL-TIME DECISION SUPPORT TOOLS

The evolution from traditional paper to integrated electronic health records creates both challenges and opportunities for physician ordering and UM. When integrated with individual payer-approved DS tools, CPOE potentially overcomes delays in agent-to-agent telephone certification with RBMs, pairing evidence-based appropriateness analyses contemporaneously with clinical decision making. Such real-time capabilities can enhance the educational role of the certification process and potentially create more durable changes in physician ordering behavior. Additionally, with real-time interactivity, DS processes may be perceived as less interfering with physician–patient relationships than RBMs.

Although enthusiasm for imaging DS tools seems greatest within the academic [28] and professional society [14] communities, a highly publicized CMS announcement [29] suggests that the payer community as well may be increasingly receptive to DS as a method of UM.

### Operations

Institutionally proprietary and commercial DS tools have been described for medical imaging [30,31], both populated with specific appropriateness criteria for various diagnostic tests and clinical situations. When physicians request imaging studies, pertinent integrated DS tools are automatically invoked by the CPOE system to guide desired ordering behavior. In most centers, adherence to DS recommendations is voluntary [28], with individual physicians ultimately retaining the authority to proceed with or cancel orders. Physicians, however, commonly override DS guidance [32], and most frequently report doing so because they were following the recommendations of specialists (55% of cases) or they disagreed with DS guidelines (25%) [33]. The ability to track these types of DS exceptions creates opportunities to modify DS criteria to match local care patterns and identify individual outlier physicians.

### Results of Implementation

In health systems in which CPOE with DS has been implemented, a slowing in the growth of targeted advanced medical imaging seems typical [30,31,33] and not dissimilar to that reported with radiology benefits management implementation. Not surprisingly, the fre-

quency of low-utility imaging decreases as more physicians use CPOE [33]. Of particular note, CPOE with DS seems more likely to decrease the frequency of medically unnecessary imaging, rather than limit appropriate studies, at least as determined by one study's authors [33].

Widespread adoption of DS will ultimately hinge, in part, on physician acceptance. At least some consider CPOE with DS a "nuisance" and believe its relevance to the care of more complex patients is limited [32]. It remains to be seen if such opinions are widespread. In addition, at least a number of physicians report "blatantly cheating" DS algorithms by checking necessary interface boxes as a means of achieving approval for tests they—not the DS software—deem appropriate. Such gaming undoubtedly occurs during interactions with RBM call centers as well. These issues illustrate the difficulties involved in algorithmically codifying a nearly infinite number of clinical situations and variables and also highlight opportunities for improvement in both systems.

## Issues and Trends

Although no comprehensive market data are available, widespread and pending implementation of CPOE with imaging DS seems at present limited. Despite increasing interest in the desirability of CPOE, a several-year-old multi-institutional survey indicated that <10% of US hospitals had fully implemented CPOE systems [34]. A recent audience survey from the Economics of Diagnostic Imaging: National Symposia suggests little interval change, at least with regard to radiology. In that 2011 survey, only 6% of attendees reported CPOE with DS currently in place at their primary institutions [35].[1] More important, almost three-quarters indicated either no institutional plans (38%) or no interest (34%) in implementation (Figure 1), portending a less than favorable outlook, at least in the near future, for DS as a widespread tool for imaging UM.

One potential explanation for the current lack of DS interest in both the hospital and provider communities is that current fee-for-service payments create a disincentive to voluntarily limit health care services. To that end, it is possible that proposed alternate payment systems that reward providers for cost savings might increase interest in DS in the future.

To date, CPOE with DS has been most commonly used in academic centers [36]. Unlike most private practice environments, such institutions are often unique in that they usually enjoy integrated centralized IT systems and usually employ both radiologists and referring physicians under the same corporate umbrella. Not surprisingly, CPOE seems most successful when its use is mandated [34], and that may be the case at some such centers. Although physician adoption rates are reported as high as 95% within best-practice centers, this level of widespread internal acceptance can take as long as a decade to achieve [28]. To that end, the potential for successful DS adoption in more fragmented health care delivery markets, in which multiple autonomous independent physicians staff multiple hospitals, is less certain. Even in markets in which CPOE with DS exists at premier institutions, a majority of regional non-network referring providers still have no system access and must use a call center to request radiologic examinations [28], creating RBM-like impediments to real-time DS. Broad-based DS acceptance and implementation may prove challenging without the removal of such obstacles.

The institutional costs of CPOE with imaging DS are not widely known but likely are not insignificant given sundry licensing, integration, training, and maintenance requirements. As with RBMs, then, at least some savings payers ostensibly derive from reductions in low-utility testing essentially represent a shift in costs to health care providers. Such misalignments of costs amongst stake-

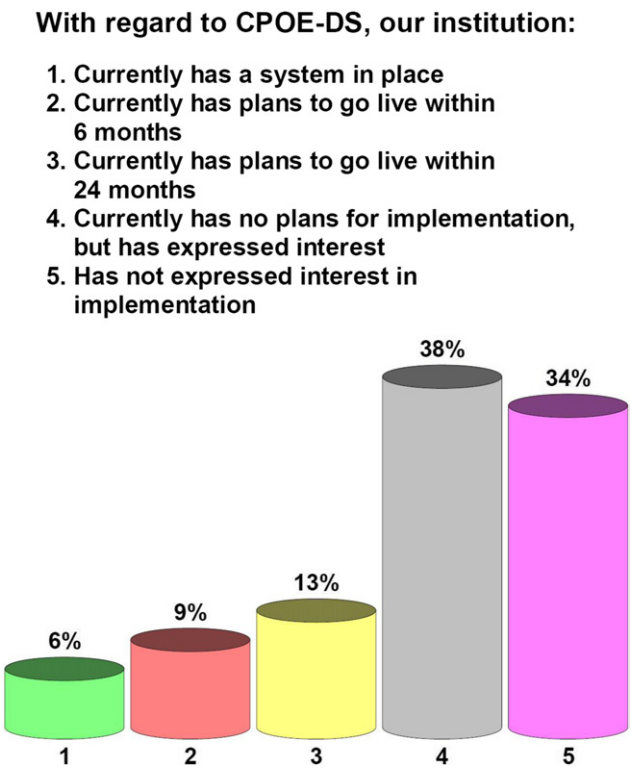


**Fig 1.** Audience-response survey data from the 2011 Economics of Diagnostic Imaging: National Symposia meeting, attended by 178 radiologists, administrators, and other radiology professionals, with regard to the status of computerized physician order entry (CPOE) with decision support (DS) at their primary practice facilities. Almost three-quarters of all attendees indicated no institutional plans or no interest in implementing such a system.

[1] The Economics of Diagnostic Imaging: National Symposia are meetings held each year in the Washington area, usually during the last week in October. Data are gathered from registrants using audience-response technology.

holders has, in fact, been cited as an impediment to CPOE implementation in other environments [37].

Some institutions have demonstrated overall facility savings after implementing system-wide CPOE [38]. At the individual service line level, however, these savings are less certain. For example, economic studies have shown contradictory results with medication CPOE systems [39]. Accordingly, favorable returns on investments cannot necessarily be generalized to all health care settings. Nonetheless, if used appropriately, DS technology may enhance the value of radiology practices seeking meaningful involvement in accountable care organizations and similar shared savings arrangements with their institutions [16].

## TAKE-HOME POINTS

- The appropriateness of medical imaging is under intense scrutiny, partly because of an unsustainable national health care spending trajectory, as well as remote disproportionate growth in the utilization of radiologic services.
- Although unit cost reduction mechanisms have traditionally been used to contain costs, UM approaches are becoming increasingly prevalent.
- Radiology benefits managers and DS systems have both demonstrated success in curtailing imaging growth, but both currently have intrinsic limitations.
- Future trends and potential roles of radiologists in these endeavors will be discussed in part 2 of this series.

## REFERENCES


1. Congressional Budget Office. The long-term outlook for healthcare spending. Available at: http://www.cbo.gov/ftpdocs/87xx/doc8758/maintext.3.1.shtml. Accessed October 19, 2011.
2. Iglehart JK. Health insurers and medical-imaging policy—a work in progress. N Engl J Med 2009;360:1030-7.
3. Levin DC, Rao VM, Parker L. Physician orders contribute to high-tech imaging slowdown. Health Aff (Millwood) 2010;29:189-95.
4. Silva E III. I can't absorb anymore. J Am Coll Radiol 2011;8:458-9.
5. Silva E III. The search for misvalued services: why is radiology a target? J Am Coll Radiol 2012;9:7-8.
6. Allen B Jr, Donovan WD, McGinty G, et al. Professional component payment reductions for diagnostic imaging examinations when more than one service is rendered by the same provider in the same session: an analysis of relevant payment policy. J Am Coll Radiol 2011;8:610-6.
7. Levin DC, Rao VM, Parker L. Trends in the utilization of outpatient advanced imaging after the deficit reduction act. J Am Coll Radiol 2012; 9:27-32.
8. Armstrong D. Medicare moves to cut "self referral" practice. The Wall Street Journal. Available at: http://online.wsj.com/article/SB118955155529824347.html. Accessed February 11, 2012.
9. Crimmins EM, Preston SH, Cohen B, eds. Explaining divergent levels of longevity in high-income countries. Washington, DC: National Academies Press; 2011.
10. Song Y, Skinner J, Bynum J, Sutherland J, Wennberg JE, Fisher ES. Regional variations in diagnostic practices. N Engl J Med 2010;363: 45-53.
11. Sirovich BE, Woloshin S, Schwartz LM. Too little? Too much? Primary care physicians' views on US healthcare: a brief report. Arch Intern Med 2011;171:1582-5.
12. Kale MS, Bishop TF, Federman AD, Keyhani S. "Top 5" lists top $5 billion. Arch Intern Med 2011;171:1856-8.
13. Qaseem A, Alguire P, Dallas P, et al. Appropriate use of screening and diagnostic tests to foster high-value, cost-conscious care. Ann Intern Med 2012;156:147-9.
14. Bernardy M, Ullrich CG, Rawson JV, et al. Strategies for managing imaging utilization. J Am Coll Radiol 2009;6:844-50.
15. Kelly AM, Cronin P. Rationing and healthcare reform: not a question of if, but when. J Am Coll Radiol 2011;8:830-7.
16. Allen B, Levin DC, Brant-Zawadzki M, Lexa FJ, Duszak R. ACR white paper: strategies for radiologists in the era of healthcare reform and accountable care organizations: a report from the ACR Future Trends Committee. J Am Coll Radiol 2011;8:309-17.
17. Hillman BJ, Joseph CA, Mabry MR, Sunshine JH, Kennedy SD, Noether M. Frequency and costs of diagnostic imaging in office practice—a comparison of self-referring and radiologist-referring physicians. N Engl J Med 1990;323:1604-8.
18. Gazelle GS, Halpern EF, Ryan HS, Tramontano AC. Utilization of diagnostic medical imaging: comparison of radiologist referral versus same-specialty referral. Radiology 2007;245:517-22.
19. Levin DC, Rao VM. Turf wars in radiology: updated evidence on the relationship between self-referral and the overutilization of imaging. J Am Coll Radiol 2008;5:806-10.
20. Levin DC, Rao VM. The effect of self-referral on utilization of advanced diagnostic imaging. AJR Am J Roentgenol 2011;196:848-52.
21. Levin DC, Bree RL, Rao VM, Johnson J. A prior authorization program of a radiology benefits management company and how it has affected utilization of advanced diagnostic imaging. J Am Coll Radiol 2010;7: 33-8.
22. Mitchell JM, Lagalia RR. Controlling the escalating use of advanced imaging: the role of radiology benefit management programs. Med Care Res Rev 2009;66:339-51.
23. American Medical Association. AMA survey of physicians on preauthorization requirements. Available at: http://www.ama-assn.org/ama1/pub/upload/mm/399/preauthorization-survey-highlights.pdf. Accessed October 20, 2011.
24. American College of Radiology and the Radiology Business Management Association. Best practices guidelines on radiology benefits management programs. Available at: http://www.acr.org/SecondaryMainMenuCategories/GR_Econ/WhatsNew/ACRRBMABestPracticesonRBMPs.aspx. Accessed October 27, 2011.
25. Duszak R. Deauthorization: the insidious new payer trick. J Am Coll Radiol 2006;3:713-5.
26. Lee DW, Rawson JV, Wade SW. Radiology benefit managers: cost saving or cost shifting? J Am Coll Radiol 2011;8:393-401.
27. Medicare Payment Advisory Commission. Report to the Congress: Medicare and the healthcare delivery system. Available at: http://medpac.gov/documents/Jun11_EntireReport.pdf. Accessed October 20, 2011.
28. Ip IK, Schneider LI, Hanson R, et al. Adoption and meaningful use of computerized physician order entry with an integrated clinical decision support system for radiology: ten-year analysis in an urban teaching hospital. J Am Coll Radiol 2012;9:129-36.
29. Centers for Medicare and Medicaid Services. CMS announces selection of demonstration participants in Medicare imaging demonstration project. Available at: http://www.cms.gov/apps/media/press/release.asp?Counter=3896&intNumPerPage=10&checkDate=&checkKey=&srchType=1&numDays=3500&srchOpt=0&srchData=&keywordType=All&chkNewsType=1%2C+2%2C+3%2C+4%2C+5&intPage=&showAll=&pYear=&year=&desc=&cboOrder=date. Accessed February 8, 2012.
30. Sistrom CL, Dang PA, Weilburg JB, Dreyer KJ, Rosenthal DI, Thrall JH. Effect of computerized order entry with integrated decision support on the growth of outpatient procedure volumes: seven-year time series analysis. Radiology 2009;251:147-55.

31. Blackmore CC, Mecklenburg RS, Kaplan GS. Effectiveness of clinical decision support in controlling inappropriate imaging. J Am Coll Radiol 2011;8:19-25.

32. Bowen S, Johnson K, Reed MH, Zhang L, Curry L. The effect of incorporating guidelines into a computerized order entry system for diagnostic imaging. J Am Coll Radiol 2011;8:251-8.

33. Rosenthal DI, Weilburg JB, Schultz T, Miller JC, Nixon V, Dreyer KJ, Thrall JH. Radiology order entry with decision support: initial clinical experience. J Am Coll Radiol 2006;3:799-806.

34. Ash JS, Gorman PN, Seshadri V, Hersh WR. Computerized physician order entry in U.S. hospitals: results of a 2002 survey. J Am Med Inform Assoc 2004;11:95-9.

35. Educational Symposia. Home page. Available at: http://www.edusymp.com. Accessed July 21, 2012.

36. The Moran Company. Assessing the budgetary implications of alternative strategies to influence utilization of diagnostic imaging services. Available at: http://rightscanrighttime.org/wp-content/uploads/2011/10/AMIC-Final-UM-Report-101820114.pdf. Accessed October 20, 2011.

37. Subramanian S, Hoover S, Gilman B, Field TS, Mutter R, Gurwitz JH. Computerized physician order entry with clinical decision support in long-term care facilities: costs and benefits to stakeholders. J Am Geriatr Soc 2007;55:1451-7.

38. Kaushal R, Jha AK, Franz C, et al; Brigham and Women's Hospital CPOE Working Group. Return on investment for a computerized physician order entry system. J Am Med Inform Assoc 2006;13:261-6.

39. Stürzlinger H, Hiebinger C, Pertl D, Traurig P. Computerized physician order entry—effectiveness and efficiency of electronic medication ordering with decision support systems. GMS Health Technol Assess 2009;5:Doc07.