

# Interdepartmental Problem-Solving as a Method for Teaching and Learning Systems-Based Practice

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**Rationale and Objectives.** Systems-based practice (SBP) has been the most difficult competency to implement in radiology residency programs, and methods for teaching and learning SBP concepts are needed. Because systems problems are usually multifactorial, a multidisciplinary approach is required. In our institution, survey data indicated patient dissatisfaction with emergency care. Prolonged wait times for radiology procedures were identified as a systems problem. When hospital administration asked the emergency medicine and radiology departments to work together to improve patient care, residents had a “real-world” opportunity to achieve the SBP competency.

**Materials and Methods.** Systems problems were identified and categorized. Data on patient transport were collected. Accurate time logs documenting when studies were ordered, performed, and interpreted were maintained. Data were analyzed at interdepartmental meetings and three improvements were planned and implemented.

**Results.** A direct line of communication was established between radiology and emergency medicine via a dedicated cellular telephone. A joint emergency medicine/radiology teaching conference was established. Additional transport personnel were employed. Residents in both departments increased their understanding of their role in the health care system, demonstrated an ability to identify systems problems and appropriately implement improvements, and enhanced their professional relationships.

**Conclusion.** This innovative method integrated educational goals with patient care goals, was grounded in “real-life” experience, and held residents accountable for results. Competence in SBP, patient care, professionalism, and interpersonal and communication skills were demonstrated. We recommend this approach as an efficient and effective way to integrate SBP into everyday clinical practice.

**Key Words.** Systems-Based Practice; Accreditation Council for Graduate Medical Education (ACGME); Residency Review Committee (RRC); Resident Education; Quality Improvement; Professionalism; Emergency Medicine; Interdepartmental Problem Solving.

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Systems-based practice (SBP) has been a difficult concept for faculty and residents across all medical specialties (1,2). A majority of diagnostic radiology program directors (78%) reported that SBP was the *most difficult* competency to implement in their residencies (2). Although physicians recognize their professional responsibility to improve the quality of patient care, few of them understand how the health care system operates or how to effectively promote systems change (3). Before 2003, SBP was not taught in traditional residency training or other educational venues for medical students and faculty (4). Once in practice, physicians typically function as “soloists”—clinical autonomists and occupational monopolists—in spite of the fact that they are delivering medical care in complex systems in collaboration with specialists from many disciplines.

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## Radiologic Education

In graduate medical education, there has always been a potential for conflict between educational needs and the efficiency of the health care system. Residents, who are accountable for the patient’s good, learn to “work around” systems to save time and take care of their patients.

This emphasis on clinical autonomy is no longer appropriate in complicated environments that depend on effective processes and efficient systems (5). An understanding of system interactions and strategies for promoting cohesion are especially important for assuring optimal patient care (5). Communication and teamwork in particular are known to be essential for delivery of high-quality, safe patient care (6,7). When SBP was introduced as a general competency, the Accreditation Council for Graduate Medical Education (ACGME) provided selected references and a “toolbox” of assessment methods, but no core content or curricula (8). If SBP is to become integrated into residency training, efficient methods for teaching SBP concepts are required. Health care improvements need not be sophisticated or elaborate or involve new devices or technologies. They can be initiated simply by learning how the work is done and reflecting on how it might be done differently (9,10). With the confluence of increasingly complex clinical needs and rapid advances in imaging technology, many “real-world” learning opportunities for the SBP competency exist in the daily routine of each resident and faculty member’s workday. As an example,

this article illustrates the educational potential of one interdepartmental problem-solving initiative as a resident learning opportunity for the SPB competency.

### **THE SYSTEMS PROBLEM**

Radiology and emergency medicine (EM) are two fast paced hospital-based specialties being practiced in an increasingly complex and fluid environment. As the demands on these health care systems multiply, improvements in the organization of work and access to timely clinical information are required to manage the workload in a safe and efficient manner (11). The main cause of patient dissatisfaction with emergency care, according to a recently published review of the emergency medicine literature, was lengthy waiting times (12). Our institutional experience supports this finding. Patient survey outcomes indicated dissatisfaction with emergency care. Prolonged wait time for radiology procedures, primarily computed tomography scans, was cited as a systems problem (13). These data suggested that improvements were needed, and hospital administration asked the radiology and EM departments to collaboratively manage the workload in an efficient manner.

### **THE SYSTEMS ANALYSIS**

An interdepartmental approach to problem solving was undertaken during the 2005 summer semester, providing an important learning opportunity for residents from both departments to participate in a systems-based project. Department chairmen, residency program directors, and chief residents met to identify systems problems. Identified problems were then categorized as interdepartmental communication, timeliness of interpretation, or professional relationship.

The analysis revealed that EM physicians requested radiology exams after-hours (5 PM–8 AM) by filling out a paper form and then paging the on-call resident. The radiology resident would then contact the appropriate technologist to provide patient information and the study protocol. Patients would then be transported from the emergency room to radiology by EM transporters or ancillary personnel. These transport personnel positions were often understaffed and had high turnover rates. Consequently, transport times of 1 hour or more were not unusual. After the radiographic study was performed, the technologist would contact the radiology resident via pager when the images were available for interpretation. After the study was interpreted, the preliminary or final result was electronically reported to the ordering EM physician by means of a dialog box which could be viewed on any of several clinical picture archiving and communication systems located in the emergency department. Next, an institutional review board–approved study was undertaken to accurately identify time parameters and common types of delays. Radiology residents were trained for data collection and maintained meticulous logs during a 4-month period. Logs were designed to record time involved in ordering, performing, and interpreting various studies as well as for patient transport between the emergency room and radiology. Study data was analyzed to identify the range, mean, and standard deviation of time involved for each of the aforementioned activities. Systems problems were discussed monthly at the resident level during regularly scheduled radiology resident meetings. Residents were asked to make constructive suggestions on how to improve the current failing system.

The chief residents from each department served as resident liaisons at the interdisciplinary EM/radiology meetings and presented resident suggestions at the administrative level.

### **RESULTS**

Study outcomes created a foundation for data-driven decision making by the interdisciplinary team. Results indicated that transport time between the EM and radiology department averaged 58.6 minutes. Interpretation time ranged from less than 5 minutes to 1.5 hours, with a mean interpretation time of 21.6 minutes. With accurate study data and constructive resident input, the interdepartmental team proceeded to plan systems improvements and achieve consensus regarding three initiatives. First, a direct line of communication was established between on-call radiology residents and an EM senior resident or attending using department-funded dedicated cellular telephones. This eliminated the outdated and inefficient alphanumeric paging system.

Second, study data clearly identified the impact created by inefficient patient transport. Additional transport personnel were employed in both departments. Ongoing informal anecdotal reports indicate departmental satisfaction with the improved transport services. Finally, an EM/radiology teaching conference was established to promote collegiality and increased communication among residents and staff of each department. The inaugural conference, held during the fall semester 2005, brought together residents from both departments to discuss typical clinical and radiographic presentations of right lower quadrant abdominal pain. To assess resident satisfaction with the new forum, one conference was randomly selected for evaluation. Participants evaluated the March 2006 conference using a standardized form and a 5-point Likert-type rating scale anchored by “5” for “exceptional” and “1” for “unsatisfactory.” Average ratings across six dimensions ranged from 4.40 to 4.00, indicating that the conference exceeded their expectations. Most highly rated aspects were the quality of cases presented for discussion (4.40) and the organization of the conference (4.33).

Resident learning outcomes included an appreciation of the potential for interdisciplinary problem solving in health care environments and enhanced awareness of their role in the health care system. Importantly, professional relationships improved as residents developed a better understanding of each others' specialty and particular difficulties in providing clinical services. Documentation of project participation has been included in the learning portfolios of participating residents.

## DISCUSSION

For SBP to become integrated into residency training and medical practice, residents need effective methods for learning SBP concepts in the course of their daily activities. When SBP was adopted as one of six competencies for residents across all medical specialties (1,2), the competency was loosely defined (eg, "awareness of and responsiveness to the larger context and system of health care" and "ability to effectively call on system resources to provide care that is of optimal value") (8) and the requisite knowledge and skills for SBP performance—resources, providers, and systems; cost-appropriate care, delivery systems, and patient advocacy—were unclear (14). It was not until 2005 that the Residency Review Committee for diagnostic radiology modified the broad ACGME definition for SBP and established specialty specific criteria to define the expected knowledge and skills pertinent to radiologists (Table 1) (15). Early recommendations to educate radiology residents and faculty about the SBP competency were to review appropriate literature; attend departmental and multidisciplinary conferences; interact with department administrators and faculty to gain an understanding of costs and reimbursements; view American College of Radiology (ACR)/Association of Program Directors in Radiology (APDR) videotapes; join and participate in radiologic societies; and schedule presentations on healthcare funding and regulation (16). This initiative incorporated many of the active learning recommendations.

**Table 1: The Residency Review Committee for Diagnostic Radiology's Definition of Systems-Based Practice**

- Understand how the components of the local and national health care system function interdependently and how changes to improve the system involve group and individual efforts.
- Optimize coordination of patient care both within one's own practice and within the health care system.
- Consult with other health care professionals, and educate health care consumers regarding the most appropriate utilization of imaging resources.

Across the medical education literature, SBP education has evolved from a combined didactic and experiential methods (4,17–22) to a more interactive approach. Clinical vignettes are used to trigger systems-based discussions on health care financing, administration, leadership, and political problems (23) and discharged patients are followed to gain information to improve discharge planning (24). SBP simulation is being used to practice coordination and teamwork (22), and a computer game has been designed to teach the principles and practical application of health economics (25). Recently, SBP was conceptualized using the metaphor of a village, made famous by then-First Lady Hillary Clinton when she said "it takes a village to raise a child," and the metaphor was supplemented experientially by multidisciplinary patient care rounds, nursing evaluations, and quality assessment systems improvement exercises (1). Each of these efforts, however, was limited by the time and faculty required to develop an effective curriculum tailored to the education and practice needs of radiology students.

Problem-solving teams are widely used in health care systems for continuous quality improvement. Approaches such as "plan-do-study/check-act" cycles have become a core element of many program and systems improvement initiatives as an application of the scientific method to implement and test the effects of change ideas on the performance of health care systems (4,9), and, increasingly, on medical education activities (26). These quality improvement activities not only provide "real-world" opportunities of daily work to teach and learn SBP concepts, but can result in significant systems improvements as well.

## CONCLUSION

This interdisciplinary team initiative provided significant opportunities for residents to participate in a system based project, a practice performance measure now required by the Residency Review Committee for diagnostic radiology (15). Residents had a practical experience that illustrated the capacity for effective change within the larger system based on data-driven decision making by professional colleagues from different disciplines. What made our approach novel was the intricate involvement of residents through each step of solving a systems-based problem. From identifying the underlying issues, gathering pertinent data, and implementing constructive ideas into a viable solution, residents played an essential role in improving patient care by fixing a broken system. It was an effective competency-based teaching and learning activity because it was explicit and clearly aligned with expected competencies, criteria-driven and focused on accountability, grounded in "real-life" experience, supportive of the residents' ability to self-assess; and individualized, providing opportunities for independent study (27). We recommend this method to other institutions seeking effective means to demonstrate resident competency in the conceptually difficult ACGME pillar of SBP.

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