Short Report
The Impact of Procedural Checklist Competency Requirements on Early Chest Port Infections

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Background and Objective: The purpose of our study was to assess resident and fellow patient care competency related to chest port catheter insertion after implementation of an educational program and completion of a certification checklist. Furthermore, we aimed to measure the impact of this intervention on early infection rates.

Materials and Methods: Baseline early infection rates as defined by the CDC were obtained in 152 consecutive patients. These were segregated by primary operator and timeframe. Following establishment of a baseline infection rate, formalized training of residents and fellows was undertaken. This included a hands-on suture workshop and satisfactory completion of a skill set with attending level certification. To evaluate competency, a procedure competency checklist was developed by the interventional radiology faculty. The checklist consisted of 17 detailed steps considered important for chest port catheter insertion. Following the training period, infection rates of 415 consecutive patients were calculated and compared to the baseline infection rates.

Results: Four out of eight (50%) residents satisfactorily demonstrated competency and were certified as primary operators for port insertion. In addition, both of the two interventional radiology fellows were certified. The early infection rates of chest port catheters placed by residents slightly decreased from 3.0% to 2.2% following the intervention compared to baseline, although this decrease was not statistically significant. Total infection rates also decreased slightly from 2.6% to 1.4%.

Conclusions: In our study, the rate of early infections after port insertion decreased following the educational intervention and certification process, although this was not statistically significant.

Keywords: Patient care competency, Port catheter, Procedure competency checklist

Introduction

The Accreditation Council for Graduate Medical Education (ACGME) requires residency programs to assess resident competency in six general areas: patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice(1). An explanation of how these areas apply to radiology has been described by the Education Committee of the Association of Program Directors in Radiology (2). In addition, the ACGME has increased the emphasis measuring educational outcomes in order to determine whether residents have achieved established learning objective. While this initiative has lead to the development of a number of tools to help measure the general competencies, it is not clear whether this process translates to improved patient outcomes. The purpose of our study was to assess resident and fellow patient care competency related to chest port catheter insertion after implementation of an educational program and completion of a certification checklist. Furthermore, we aimed to measure the impact of this intervention on early infection rates.

Central line associated blood stream infections (CLABSI) are a potential complication of

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subcutaneous chest port catheter insertion. While subcutaneous port catheters have a lower incidence of infection than other central venous access catheters, adverse events still occur resulting in prolonged hospital stays, increased cost, morbidity and mortality. Early infections (defined as occurring within thirty days of placement) may be due to a variety of factors, including insertion technique, patient skin preparation, and operator experience. As part of a continuous quality improvement project to evaluate the impact of a multilevel intervention of formalized training and certification of residents, fellows, and technologists on early infection rates, we studied the impact of procedural checklist competency requirements on early chest port infections.

Materials and Methods

Per institutional protocol, the study was IRB exempt as it was part of a continuous quality improvement project. No internal or external funding was required. Baseline early infection rates as defined by the CDC were obtained in 152 consecutive patients. These were segregated by primary operator (attending, fellow, resident) and timeframe. Following establishment of a baseline infection rate, formalized training of residents and fellows was undertaken. This included a hands-on suture workshop and satisfactory completion of a skill set with attending level certification. To evaluate resident/fellow competency, a procedure competency checklist was developed by the interventional radiology faculty. The checklist consisted of 17 detailed steps considered important for chest port catheter insertion, and was completed by attending physicians while directly observing a trainee. In addition to residents and fellows, formalized training of technologists was performed. This included observation of a demonstration about sterile technique, completion of an inservice on prevention of port infection, and completion of a port placement checklist during subsequent cases. Following the training period, infection rates of 415 consecutive patients were calculated and compared to the baseline infection rates.

Results

During the intervention period, a total of eight eligible residents (post-graduate year three or higher) rotated through the interventional radiology section who had completed the suture workshop. Four out of eight (50%) residents satisfactorily demonstrated competency and were certified as primary operators for port insertion. In addition, both of the two interventional radiology fellows were certified.

The early infection rates of chest port catheters placed by residents slightly decreased from 3.0% to 2.2% following the intervention compared to baseline, although this decrease was not statistically significant (Table 1). Total infection rates also decreased slightly from 2.6% to 1.4%. The intervention and formalized process received positive feedback.

Table 1: Early infection rates prior to and following intervention.

	Prior to intervention	Following intervention
Resident	3.0 % (2/67)	2.2% (2/89)
Fellow	NA	0.6% (1/170)
Attending	2.4% (2/85)	1.9% (3/156)
Total	2.6% (4/152)	1.4% (6/415)

Discussion

Although radiology residency programs are required to assess resident competency in the six areas outlined by the ACGME, there is a paucity of tools available to assess these skills. The Education Committee of the Association of Program Directors in Radiology developed a global rating form to evaluate resident competence in all six areas collectively (3).

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However, there is concern that current assessment tools are unable to measure the competencies independently of one another (4). We designed the chest port catheter insertion certification checklist to focus on the patient care competency requirement.

Efforts to measure resident competency have been reported in other radiology departments, often focusing on multiple skills. For example, Wood et al. developed a 360-degree evaluation form to assess professionalism and interpersonal/ communication skills during breast biopsy procedures using a Likert-type scale (5). This method provides more flexibility and scope for difficult to measure abilities such as professionalism and interpersonal/communication skills. In contrast, the certification checklist used in our study may be more amenable to measuring procedural skills. In addition to formalized training sessions, other programs are utilizing simulation to improve resident procedural skills. For example, Mendiratta-Lala et al. developed an educational program incorporating simulation to improve resident proficiency in performing ultrasound-guided procedures (6).

While other programs have examined similar methods to assess resident competency, there has been little work done to evaluate the impact of these tools on patient outcomes. In our study, the rate of early infections after port insertion decreased following the educational intervention and certification process (although this was not statistically significant).

Overall, the infection rates in our study were similar to other single-institution reports of infection rates for subcutaneous chest port catheters (ranging from 1.89-5.7%), although these studies did not differentiate early and late infections (7-10). Future work should examine other ways to determine how documentation of resident competency influences patient outcomes.

Outside the realm of radiology, other specialties have developed a variety of tools to measure the general competencies. Global rating forms are among the most commonly used assessment tools, which are primarily used to assess a resident's ability in multiple scenarios. In contrast, our study used direct observation to focus on one particular skill. This method may be more amenable to measuring the impact of interventions to improve resident competency on specific patient outcomes. Overall, this study examines the impact of an educational intervention to improve resident competency in chest port catheter insertion on early infection rates. Future work will address incorporating the checklist certification process into the residency program and potentially expanding this process to include other procedures. Furthermore, future efforts could be targeted towards the other general competencies, in addition to patient care.

Conclusion

In our study, the rate of early infections after port insertion decreased following the educational intervention and certification process, although this was not statistically significant.

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