Evidence-based Process for Improving Resident CT Protocol Competency

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Abstract

The purpose of this project was to improve resident competency in protocolling CT studies using a web-based electronic protocol system and teaching module. Henry Ford Hospital recently implemented an electronic protocol process, allowing for quick and easy review of patient data, the original imaging request, and the appropriate available imaging protocols. An additional benefit of this electronic system is the ease of documentation and review of protocol mistakes. When a protocol mistake is identified, an override is initiated and the appropriate change is made. We reviewed protocol overrides over a 3-month period and examined the patterns of errors. A web-based PowerPoint module instructing residents how to correct those errors was instituted. The module specifically addressed protocol processing, careful request review, appropriate contrast use and volume, and those clinical scenarios where accurate protocolling may require staff involvement. All residents were assigned the module and override patterns were then re-evaluated.

Purpose and Background

Managing and understanding CT protocols are an integral part of a radiology resident education. However, differences between institutions, imaging equipment, and imaging objectives make the protocol process tedious and error prone. When protocol errors do occur, the resident who made the error is often different than the one making corrections, and thus unable to learn from the mistake. Furthermore, the intricacies of the protocol process are often difficult to teach in a didactic environment, making the learning process a "learn-as-you-go" model.

Recently, Henry Ford Hospital implemented an electronic protocol system. Beyond the numerous advantages this provides to workflow and patient throughput, the ability to easily identify errors provides a unique opportunity to improve resident competency in protocolling CT studies. Utilizing this information, our project's intent was to design and institute an evidence-based protocol teaching module for Henry Ford radiology residents.

Methods

Using the electronic override system, we reviewed protocol overrides over a 3-month period and examined the patterns of errors. A web-based PowerPoint module instructing residents how to correct those errors was then created.

The teaching module (example cases shown below) included sets of protocol situations that the resident may encounter. The goal of the teaching module was to include cases which specifically addressed those issues most commonly requiring protocol overrides. The cases included situations that arise frequently and therefore must be understood in order for a resident to function on a day-to-day basis. Cases requiring a more advanced level of understanding were also included.

Residents were then assigned to complete the online module. Following completion of the module by all residents, the number of protocol overrides were again analyzed over a 5 week period.

The Protocol System – How it Works

Fig. 1

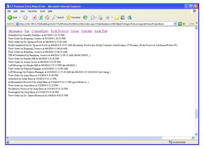

Fig. 2

Fig. 3

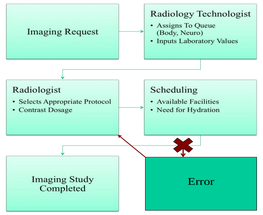

Fig. 4

Fig. 1 – Web-based protocol site. Here the resident can review the request, recent labs, and select the appropriate protocol.

Fig. 2 – Audit trail. Here actions taken by the technologists and radiologists are documented (including overrides).

Fig. 3 – Protocols. All applicable protocols are available for the radiologist to select. In addition, special instructions can be input at this time.

Fig. 4 – Flow chart of the protocol process.

Results

Over the initial three month period, over 6600 imaging studies were protocolled with 224 (3.4%) overrides reported. Common errors included issues with patient contrast allergy (10%), contrast use or contrast volume reduction (26%), and inappropriate protocol being selected (52%). This information allowed for the successful implementation of an evidence-based online teaching module.

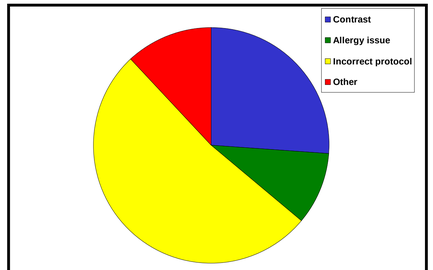

Fig 5. Common protocolling errors

During the 5 week period following implementation of the teaching module, the rate of overrides fell to 2.8% (107 overrides of 3800 studies completed), an 18% reduction.

Conclusion

Improving resident competency in protocolling imaging studies is an important part of radiology resident education. Yet as the protocol process becomes more complex, the "learn-as-you-go" model no longer suffices as a teaching method.

By utilizing the electronic protocol system, we were able to readily identify resident weaknesses in protocolling and create an evidence-based teaching module addressing those areas. After implementing this module in our residency program we observed a significant reduction in protocol errors as evidenced by the decreased number of protocol overrides.

Given our success in reducing protocolling errors, we plan to continue using the protocol system to identify additional errors and further enhance our teaching module. We hope to permanently integrate this module into our radiology resident curriculum. Evidence-based modules such as this, which emphasize case-based learning, may one day become a standard part of the radiology resident education.

Teaching Module – Example Cases