



Fluoroscopic practice patterns in pediatric radiology during pregnancy

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Received: 21 February 2019 / Accepted: 8 March 2019 / Published online: 1 June 2019
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During the 21st century there has been an increase in the proportion of women in medicine, accompanied by an increase in women choosing radiology as their specialty [1]. This is even more pronounced in the field of pediatric radiology [2]. Pediatric radiologists are frequently required to perform diagnostic fluoroscopy studies, typically short in duration and if done appropriately using dose-reduction features (e.g., pulsed fluoroscopy, last-image capture, and minimizing fluoroscopy time and magnification) they are associated with low radiation doses to patients and staff [3]. Occasionally there is a need to perform an intussusception reduction, which might be associated with a higher radiation exposure because of the longer duration of the procedure.

A pediatric radiology attending physician or trainee who becomes pregnant frequently faces dilemmas that women in most other professions do not. First is the decision whether to declare pregnancy in its early stage in order to avoid fetal exposure to radiation. At its early stage, pregnancy is a sensitive matter requiring adjustment of the woman and her family. Furthermore, there is a relatively high risk of miscarriage in the first trimester. Therefore women usually do not announce their pregnancy during the first trimester and in many instances choose to delay informing their co-workers and managers until the pregnancy is clearly visible. According to a recent survey of members of the Society for Pediatric Radiology (SPR) [4], 72% of the survey respondents who were pregnant as attending pediatric radiologists or trainees chose to declare their pregnancy in the first trimester. The second dilemma is with regard to performing fluoroscopy; 85% of the survey respondents performed fluoroscopy while pregnant.

In the absence of a departmental policy, pregnant pediatric radiologists and trainees need to rely on their colleagues' goodwill and risk negative reactions from their colleagues. This is reflected in the results of the survey [4]. Twenty percent of survey respondents who as attending pediatric radiologists or trainees elected to reduce or eliminate fluoroscopy studies during their pregnancy experienced a negative impact on their professional relationships or their career.

In the United States, declaration of pregnancy is strictly voluntary and a pregnant radiology worker who declares pregnancy is issued a fetal dosimeter to be worn at the level of the abdomen under any lead protective garments. The monthly dose readings are monitored by the departmental radiation safety officer to verify that the regulatory fetal dose limits are not exceeded. According to the National Council on Radiation Protection (NCRP), the fetal dose limit should be 500 mrem (5 mSv) over the duration of the pregnancy, or 50 mrem (0.5 mSv) per month [1, 4].

There are no detailed national or state policies in the United States addressing the issue of fluoroscopy practice during pregnancy, and in most radiology departments written policies dealing with this matter are non-existent [5]. This leads to ambiguity and places the pregnant radiologist in an awkward position that can result in negative reactions from her colleagues and directors. For example, a female colleague might think that if she performed fluoroscopy during her own pregnancies there is no valid reason for other pregnant radiologists not to perform the same procedures. Additionally, a male colleague might observe different fluoroscopic practices among pregnant colleagues and perceive those who do not perform fluoroscopy during pregnancy as untrustworthy colleagues. According to the survey of SPR members [4], 11% of the respondents witnessing pregnant colleagues who reduced or eliminated their fluoroscopy practices observed a negative impact on those colleagues' professional relationships or career.

In reality, this percentage might be higher than reported in the survey, and therefore the negative impact on pregnant pediatric radiologists' careers could be even more unfavorable.

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This is a result of bias secondary to the fact that the survey respondents' population consisted of 65% females while the percentage of females in radiology and in pediatric radiology is significantly lower (27% and 38%, respectively) according to data from 2009 [2]. It is reasonable to assume that women who were pregnant as radiology trainees or pediatric radiology attendings were more likely to respond to the survey than others, and that these women would be more empathetic toward a pregnant colleague while males and females who were not pregnant would be less empathetic.

According to a survey of program directors published in 2006 [5], the majority of radiology programs in the United States did not have a written policy on fluoroscopy during pregnancy and the majority of surveyed program directors supported the creation of such policy for radiology residents. A written departmental policy for pregnant radiologists and trainees might provide a solution to the problem by reducing the ambiguity and possibly the negative impact on the careers of pregnant pediatric radiologists and radiology trainees. Such a policy should be tailored to the specific departmental needs and resources (e.g., size of the residency program, number of attendings covering calls and frequency of fluoroscopic and interventional procedures) and focus on attending pediatric radiologists and trainees who perform diagnostic fluoroscopic studies and interventional procedures. The policy should specify the type of shielding that would be provided to minimize fetal exposure while reducing maternal injury, the type of studies that might be performed during pregnancy (e.g., diagnostic vs. interventional procedures), and the frequency of studies during working hours and on call.

The policy should be based on scientific evidence taking into account background radiation (shown to range from 0.5 mSv to 1 mSv to the fetus during the entire pregnancy) [6], and fetal doses reported from studies performed on pregnant radiologists with data gathered from their fetal badges. While there is no adequate literature on fetal doses from low-dose diagnostic fluoroscopy studies typically performed by pediatric radiologists (e.g., voiding cystourethrography, upper gastrointestinal [GI] series and contrast enemas), there are studies on data gathered from fetal badges of interventional radiologists that have demonstrated very low levels far below the recommended thresholds during pregnancy [7, 8]. The expected fetal doses from pediatric radiology diagnostic fluoroscopy studies are lower by at least an order of magnitude and possibly even negligible when compared to background radiation; nevertheless, additional research is required in this area.

As an example, a departmental policy might allow a pregnant pediatric radiologist or trainee to perform diagnostic fluoroscopy studies such as upper GI series and voiding cystourethrograms but recommend refraining from interventional radiology procedures such as digital subtraction

angiography or percutaneous cholangiography. Alternatively, fluoroscopy duties during pregnancy might be limited to what is required during calls in order to not alter the call schedule and increase the call burden of the pregnant radiologist's or trainee's colleagues.

Fetal badges should continue to be monitored closely to prevent excessive fetal doses. If pregnant radiologists or trainees are required to perform fluoroscopic studies or procedures, an additional important issue that needs to be addressed by the departmental policy is appropriate shielding. Lead aprons that appropriately fit the pregnant radiologist while protecting the fetus adequately should be provided to minimize physical strain and injury.

In summary, pregnant pediatric radiologists and radiology trainees face dilemmas that in the absence of departmental policy can lead to a negative impact on their professional relationships and their careers. Creation of departmental policies with regard to fluoroscopic practice during pregnancy might provide a solution to the problem. These policies should be based on scientific evidence and tailored to the departmental needs and should be presented to all attendings and trainees in the department.

Compliance with ethical standards

Conflicts of interest None

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