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Defining the Key Competencies in Radiation Protection for Endovascular Procedures: A Multispecialty Delphi Consensus Study

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WHAT THIS PAPER ADDS

This paper defines the key competencies in radiation protection. These are the knowledge skills, technical skills, and attitudes that all healthcare workers involved in endovascular procedures should know, to ensure the safety of both patients and themselves. The paper explores the discrepancies in ratings between vascular surgeons, interventional radiologists, and interventional cardiologists, and addresses problems with the current system of radiation protection education and the need for up to date and relevant, concise training programs.

Objectives: Radiation protection training courses currently focus on broad knowledge topics which may not always be relevant in daily practice. The goal of this study was to determine the key competencies in radiation protection that every endovascular team member should possess and apply routinely, through multispecialty clinical content expert consensus.

Methods: Consensus was obtained through a two round modified Delphi methodology. The expert panel consisted of European vascular surgeons, interventional radiologists, and interventional cardiologists/angiologists experienced in endovascular procedures. An initial list of statements, covering knowledge skills, technical skills and attitudes was created, based on a literature search. Additional statements could be suggested by the experts in the first Delphi round. Each of the statements had to be rated on a 5- point Likert scale. A statement was considered to be a key competency when the internal consistency was greater than alpha = 0.80 and at least 80% of the experts agreed (rating 4/5) or strongly agreed (rating 5/5) with the statement. Questionnaires were emailed to panel members using the Surveymonkey service.

Results: Forty-one of 65 (63.1%) invited experts agreed to participate in the study. The response rates were 36 out of 41 (87.8%): overall 38 out of 41(92.6%) in the first round and 36 out of 38 (94.7%) in the second round. The 71 primary statements were supplemented with nine items suggested by the panel. The results showed excellent consensus among responders (Cronbach's alpha = 0.937 first round; 0.958 s round). Experts achieved a consensus that 30 of 33 knowledge skills (90.9%), 23 of 27 technical skills (82.1%), and 15 of 20 attitudes (75.0%) should be considered as key competencies.

Conclusions: A multispecialty European endovascular expert panel reached consensus about the key competencies in radiation protection. These results may serve to create practical and relevant radiation protection training courses in the future, enhancing radiation safety for both patients and the entire endovascular team.

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INTRODUCTION

Background/rationale

Endovascular procedures have become the treatment choice for most cardiovascular pathologies. Often, these minimally invasive procedures result in shorter recovery times than conventional approaches. However, X-rays used during these procedures can cause important biological effects: deterministic effects occur if a threshold dose is exceeded, causing skin damage, hair loss, etc.; and

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stochastic effects, responsible for various solid organ cancers and leukemia, which can occur at any dose, but the risk increases at higher doses.[1,2] Both patients and healthcare workers are at risk, as increased incidences of conditions such as posterior subcapsular cataract have been reported in healthcare workers chronically exposed to ionizing radiation.[3,4] Therefore, to protect patients and healthcare workers, it is crucial that radiation doses are minimized, without jeopardising quality or safety during endovascular procedures. This is the basis of radiation protection, also called the ALARA principle (As Low As Reasonably Achievable).[1,5]

To ensure that healthcare workers apply these principles in daily practice, appropriate education, followed by refresher courses is essential.[6,7] The Euratom Basic Safety Standards Directive 2013/59, issued by the European Commission states: "…practitioners and individuals involved in the practical aspects of medical radiological procedures have adequate education, information and theoretical and practical training for the purpose of medical radiological practices, as well as relevant competence in radiation protection."[8]

Unfortunately, "adequate" training has not been clearly defined and specific training curricula are lacking, causing variations in content, format and requirements across Europe. International guidelines[8–10] were developed to design more uniform radiation protection training; however, these documents often cover a multitude of topics (e.g. elemental physics, practical radiation protection aspects, various imaging modalities), which may not always be relevant or feasible to implement in daily practice. Additionally, these guidelines are often not up to date with new technologies, which are increasingly being used to reduce radiation.[11,12]

To create relevant and uniform European training and refresher courses, it is necessary to first define which competencies in radiation protection (knowledge skills, technical skills and attitudes) are the most important and relevant for all healthcare workers active in (hybrid) angiography suites. This study was initiated to identify these key competencies.

MATERIALS AND METHODS

The Delphi technique

This study was conducted using an email based modified Delphi technique. The Delphi methodology has already been used in various areas of healthcare research to obtain expert consensus.[13] It is an iterative and structured consensus forming process, conducted through multiple successive rating rounds. Participants evaluate Delphi statements and further re-evaluate these statements in subsequent rounds, based upon anonymous controlled feedback about group responses. This process is repeated until consensus is achieved or a predetermined number of rounds is completed.[13–16]

This technique has important benefits. Firstly, emailed questionnaires allow panel members from various geographical locations to participate without logistic problems. Secondly, the modified Delphi technique is conducted anonymously, ensuring that participants have equal possibilities to give or change their opinion during the process, eliminating the risk of having dominant panel members, which may occur with face to face consensus formation strategies.

Expert panel

A heterogeneous expert panel of European vascular surgeons, interventional radiologists, and interventional cardiologists/angiologists was identified through purposive sampling and invited. An expert was defined as someone with experience in endovascular procedures, a high volume clinical practice, and sufficient knowledge about clinical content (indicated by their publication track record and/or appearance as congress faculty). Considering expert dropout, the study aimed to have at least 5–10 experts per discipline, which has been suggested as a minimum when working with different professional groups.[16,17] All participants gave written consent prior to the start of the study and their identity remained hidden during the study's course.

Survey and Delphi statements

The first round Delphi statements were defined prior the start of the study, based on radiation protection literature and international recommendations and adapted to the knowledge/skills/attitudes framework.[1,5,8–10,18] All statements were reviewed by the research team, comprising three vascular surgeons and one physicist. In total, the first Delphi round contained 71 statements (29 knowledge, 25 technical skill and 17 attitude statements) which had to be rated on a 5 point Likert scale ranging from '1, Strongly disagree' to '3, Neutral' to '5, Strongly agree'. Additionally, experts could provide comments and suggest new statements. Information about participants' demographics, endovascular experience and radiation protection habits were collected through a questionnaire included in the first round survey.

Consensus

There are no formal criteria to define consensus in an expert panel,[13] therefore this study used two frequently used measures: firstly, the Cronbach's Alpha score,[7,19] for which an alpha value of 0.80 was chosen as an indicator of consensus; secondly, the percentage of experts (dis) agreeing with a statement.[13,17] If at least 80% of the experts scored an item as "(Dis)agree" or "Strongly (dis)agree", it was considered as panel (dis)agreement.

Delphi rounds: Data collection

Responses were collected through SurveyMonkey (SurveyMonkey Inc., San Mateo, CA, USA). Participants had 5 weeks to complete each round, with reminders being sent to non-responders in the third and fifth week. After the first round, participants' comments about the Delphi statements and suggestions for new statements were processed and

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