

# PROTOCOL FOR “RISK FACTORS FOR NEW-ONSET ATRIAL FIBRILLATION DURING CRITICAL ILLNESS: A DELPHI STUDY”

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*CONFLICTS OF INTEREST*

There are no conflicts of interest

## INTRODUCTION

New-onset atrial fibrillation (NOAF) is a common phenomenon in patients admitted to an intensive care unit (ICU)<sup>1</sup>. It has deleterious haemodynamic effects<sup>2</sup> and is associated with thromboembolic events<sup>3</sup>. It is independently associated with ICU and hospital mortality<sup>4-6</sup>.

Many risk factors for developing NOAF during an ICU stay have been identified. These include demographic and comorbidity-related factors, along with acute factors such as disease severity<sup>4,7,8</sup>. The evidence for modifiable antecedents is scarce as potential targets for prevention have not been studied in detail<sup>9</sup>.

Variables are often studied because they are readily available or because they reflect the research teams' underlying assumptions. Systematic reviews are helpful to examine the current body of evidence however they can only identify risk factors that have already been studied. They therefore have limited value in identifying potential risk factors for future study. This can result established risk factors being repeatedly identified, but with limited extension of knowledge.

In the context of inconclusive findings, or where potential risk factors have not been fully considered, it is useful to develop an expert consensus. This can help provide informed direction for future study. The Delphi process is an established method to develop expert consensus<sup>10</sup>. This involves using structured or semi-structured rounds of individual questioning to a panel of experts<sup>11,12</sup>. In subsequent rounds of questioning, participants adapt their responses according to feedback from previous rounds. The Delphi process is designed to then provide a consensus after a series of these rounds.

There is no consensus as to the optimal number of participants in a Delphi process. Panel size will vary depending on the nature of the subject being addressed and the resources available<sup>13</sup>. Five to fifteen experts are considered adequate to achieve content validity<sup>12,14</sup>.

The benefits of the Delphi technique include reducing the effects of bias due to group interaction, assuring anonymity and providing controlled feedback to participants. Three rounds are usually sufficient to arrive at consensus<sup>12,15</sup>. When properly employed, the Delphi technique has the potential to create an environment that will allow experts to arrive at justifiable, valid and credible suggestions based on the best available evidence and their expertise.

## KEY PRINCIPLES

### *ANONYMITY AND INFORMATION FLOW*

An important aspect of the Delphi process is the anonymity of the expert panel members who remain unknown to one another. Interactions occur between a facilitator and each panel member, but never between panel members. The process thereby allows all members of the panel to offer their opinion without interpersonal factors affecting decisions<sup>16</sup>. Informal methods of reaching consensus, such as committees, are vulnerable to domination by individuals in more senior positions or the biasing effects of personality traits<sup>17</sup>. Delphi processes are therefore thought to provide more useful and accurate judgements than those obtained either by individuals or by interacting groups.

## FEEDBACK

The facilitator acts to curate and filter information at each stage. After each round, individual panel members are shown the collated results of the panel's responses. This allows participants to assimilate this information and use it to modify their responses to subsequent rounds.

## METHODS

We will use the Conducting and REporting DElphi Studies (CREDES) guidance to plan and report our Delphi process<sup>18</sup>.

### PANEL SELECTION

We will identify potential participants from the author lists of articles included in a recent systematic review of risk factors for NOAF in patients in an ICU<sup>9</sup>. We hope to include general intensive care physicians, cardiac intensive care physicians and cardiologists, along with other relevant health professionals. We will use the Scopus database<sup>19</sup> to present H-indices demonstrating author-level publication metrics whilst maintaining anonymity. Using a search of the Medline database, we will report the number of publications by the panel members with "atrial fibrillation" in the title to demonstrate panel expertise.

### PROCEDURE

The proposed Delphi process is displayed in figure 1.

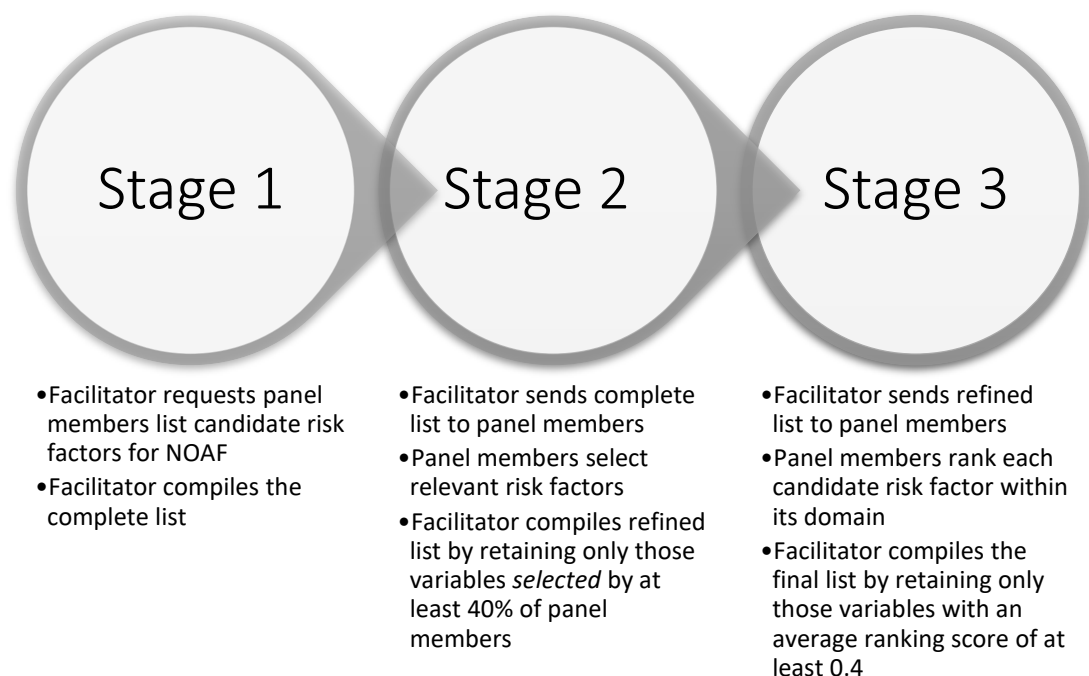


Figure 1 - The Delphi process

### ROUND 1

We will ask panel members to list those factors they feel are associated with the development of NOAF in patients on an ICU. We will suggest six categories to provide structure to answers. These will include demographics; comorbidities; disease, and disease-severity-related variables; investigation results; interventions; and vital signs.

### ROUND 2

We will provide each panel member with the complete list of variables generated by the panel during round 1. We will ask each panel member to select those variables that they feel are associated with NOAF. We will then refine the complete list by retaining only those variables selected by at least 40% of panel members<sup>20</sup>.

### ROUND 3

Variables that meet retention criteria in round 2 will be fed back to the Delphi panel. The members of the panel will be asked to rank each variable by perceived strength of association with the development of NOAF. Ranking of variables will occur within each variable's domain e.g. demographic factors will be ranked in isolation from comorbidity factors. In order to produce a final list of variables felt to be important predictors of NOAF, we will exclude variables with an average ranking score of less than 0.4. The average ranking score will ensure variable exclusion will not be inevitable i.e. all variables within a domain could be carried through to the final list given sufficient spread of votes.

### AVERAGE RANKING

We will calculate a normalised average ranking score to determine which answers in each domain are most preferred by the panel. Possible scores range from 0-1. The answer choice with the largest average ranking score per domain represents the most preferred choice.

We will calculate the ranking score for each variable as follows:

$$\frac{x_1w_1 + x_2w_2 + x_3w_3 \dots x_nw_n}{\text{Total number of responses for variable} \times \text{total number of candidate variables within domain}}$$

Where:

$1, 2, 3 \dots n$  = rank choice

$x$  = Number of votes for rank choice

$w$  = weight of ranked position. Weights are the inverse of respondents' chosen ranks. Position 1 receives the highest weight which equals the number of rank choices. E.g. in a question with 3 candidate variables,  $w_1=3$ . The last rank choice has a weight of 1.

### SYNTHESIS

We will present the final list of candidate risk factors by domain. We will present each risk factor alongside its mean ranking, its ranking range, and its normalised average ranking score.

## DISCUSSION

### MAIN FINDINGS

Our study will report an expert consensus of important candidate risk factors for new-onset atrial fibrillation in patients on an ICU. We will discuss the results in the context of current evidence. We will highlight the evidence supporting suggested modifiable risk factors. We will identify suggested risk factors that are not currently supported by evidence as candidates for future research.

### IMPLICATIONS

This study will be the first investigation of candidate risk factors for NOAF in patients in ICU using a Delphi method. The results of this Delphi process will demonstrate the current opinions of experts regarding important risk factors for NOAF. It will also help guide future research by revealing potential modifiable risk factors that have not been previously studied. Research into preventable risk factors for NOAF inpatients in ICU has the potential to improve the care of this vulnerable group.

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