Integration of Human Factors Analysis and Classification System (HFACS) into Radiation Incident Investigations

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INTRODUCTION

Modern healthcare draws heavily upon the diverse skill sets of multidisciplinary teams to work together as a cohesive unit to deliver effective and safe care. Like all humans, healthcare professionals are fallible and will make errors irrespective of how experience, committed and careful they are [Reason, 1990]. When errors occur, a critical task of the healthcare system is to have mechanisms in place to acknowledge and analyse the errors.

Our center uses a standard Root Cause Analysis (RCA) framework which has greatly improved the quality of incident investigation in our setting and staffs are enthusiastic about its use. However, staffs are not always successful in applying it due to the sensitivity of organization culture, systems and approach to how RCA is conducted and resultant learning is disseminated. For example complex system issues such as the influence of culture, non-technical skills and behaviors of senior staff may be side-lined in the investigation process as they may be difficult to quantify and provide evidence. More work needs to be done in healthcare safety, to place human factors as important aspects of incident investigations.

OBJECTIVE

This project aims to evaluate the integration of human factors into radiation incident investigation. It adopts the Human Factors Analysis and Classification System (HFACS) originally developed in aviation, to examine the quality and the continuity of identifying human factors in the RCA process. The results of this project will allow us to develop a systematic, comprehensive and efficient investigation protocol to incorporate both systems and human factors in Radiation Incident analysis

METHODOLOGY

Retrospectively review approximately 40 near misses and actual cases that have been thoroughly investigated using RCA in our department. The process starts by examining the chain of events that led to an accident or adverse outcome and considering the actions of those involved. This also includes reviewing through the recommendations from all the near misses and actual case reports.

Apply HFACS to identify the care management problems and classify the error producing conditions and organizational factors in a single broad framework of factors affecting clinical practice. Evaluate if there are (1) any differences between the RCA and HFAC results and (2) effectiveness of follow up actions using FACES [Feasibility, Acceptability, Cost, Effectiveness & Sustainability] Interventions Assessment.

Fig 1. HFACS Mapping
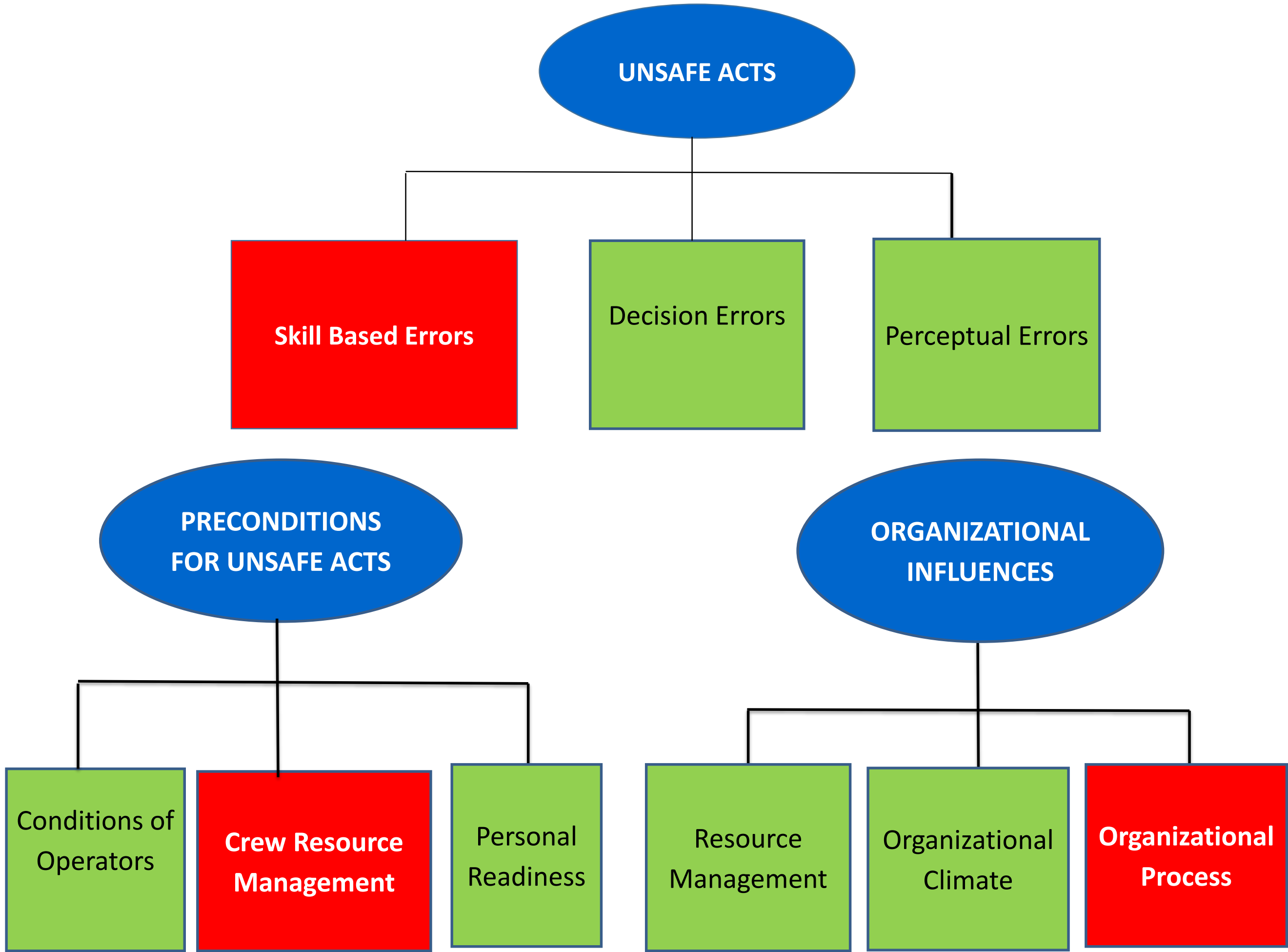
RESULTS

A total of 42 near misses and actual cases have been analyzed. From the results, we found that our incidents analyzed using RCA methodology does not categorize the contributing factors attributing to humans at granular level. (Fig 2). When the accumulated events are further examined using HFACS, trends can be observed that provide guidance for prioritizing interventions to address recurrent "holes. (Fig 3)

Fig 2. RCA Categorisation

Fig 3. HFACS Categorisation
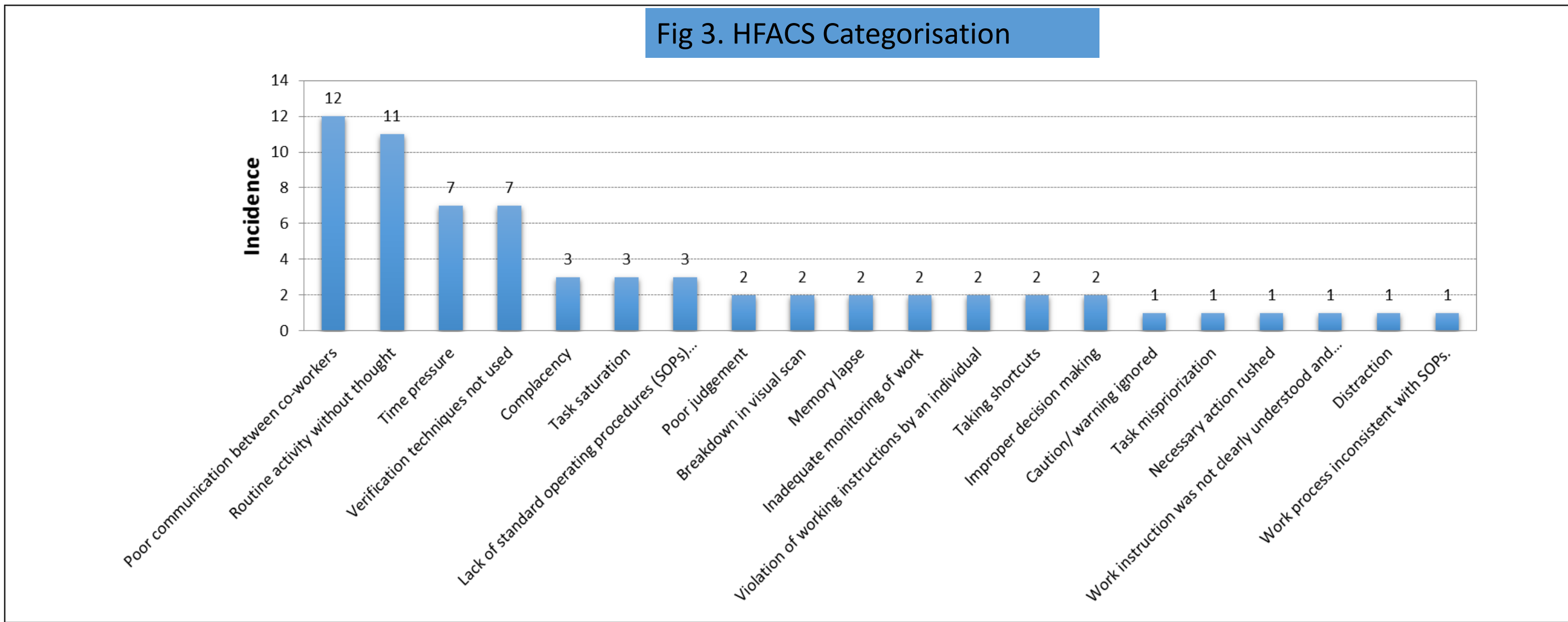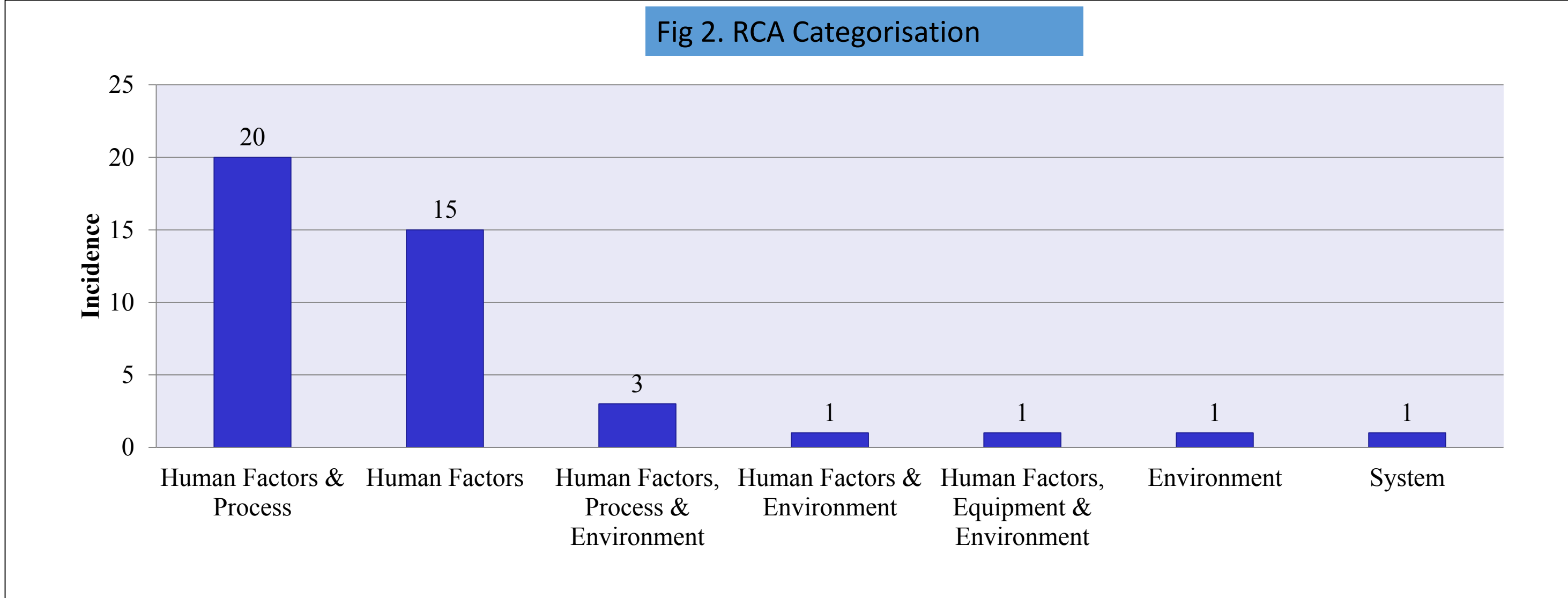
DISCUSSIONS

HFACS display proved to be an effective communication tool for management illustrating the complexity of the causes behind the term " human error". It is also a great methodology that complements our RCA findings in all our investigations. The top three categories of failures were easily identified and follow up actions implemented using the Feasibility, Acceptability, Cost, Effectiveness & Sustainability (FACES) Interventions Assessment methods .

A)Example of top three categories of Human failure

1.Unsafe Acts:
- Skill based errors – Routine activity without thought, complacency, inadequate execution, omitted steps in procedures

2.Preconditions:
- Crew Resource management – Poor Communication between team members; lack of team work; Misinterpretation of information

3.Organizational Influences:
- Organizational Process – Time Pressure,

B) Example of Follow up actions using FACES Strategies

Feasibility: Can it be done?

Acceptability: Will users accept it?

Cost: Can we afford it (funding)?

Effectiveness: Will it work?

Sustainability: Will it last/ be supported/ maintained?

Interventions	Feasibility	Acceptability	Cost	Effectiveness	Sustainability	Final Score
Flow chart of work process for planned electron case implemented and disseminated to the sub-process owners	5	5	5	4	4	23
Bi-monthly audit check of electron treatment process	3	3	5	4	3	18
Electron mark out work instruction and training	5	5	5	5	5	25

CONCLUSION

Our study adapted an investigators quality tool (HFACS), originally developed in aviation, to examine the quality and the continuity of identifying human factors in our RCA process. The key findings showed that human factors were often not identified by the root cause analysis process. Mismatches were also identified between a contributing factor identified in the investigation and the recommendations and action plans.

The human factors tool, HFACS, has proven to be a successful methodology to complement RCA in evaluating the integration of human factors into our complex radiation incident investigations. HFACS offers a structured and systematic approach, that incorporates both systems and human factors in incident investigations and importantly drawing out the lessons for enhancing patient safety. The application of FACES risk treatment strategies have also provided opportunity to develop successful human errors intervention strategy.

References:
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