

**Assessing Performance on Professional, Health Advocate and Scholar
During Crisis Simulation**

A thesis submitted to the Faculty of Graduate and Post-doctoral Studies in
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List of Acronyms and Abbreviations

% VC: Percentage of variance component

ACGME: Accreditation Council for Graduate Medical Education

CanMEDS: The Canadian Medical Education Directives for Specialists

CBME: Competency Based Medical Education

CTT: Classical test theory

CU: Construct underrepresentation

CIV: Construct irrelevant variance

DNR: Do not resuscitate

D-Study: Decision Study

G-coefficient: generalizability coefficient

GIOSAT: Generic Integrated Objective Structured Assessment Tool

G-Study: generalizability study

ME: Medical Expert

MOD: Morphine overdose

OSCE: Objective Structured Clinical Examination

PGY: Post graduate year of residency

PHAS: Professional, Health Advocate and Scholar

PI: Principal investigator

R: Pearson's Correlation coefficient

RCPSC: Royal College of Physicians and Surgeons of Canada

REB: Research Ethics Board

VC: variance component

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Dedication

I dedicate this thesis to my lovely wife and family. Without their support and understanding this effort would have been impossible.

Abstract

The objective was to assess Professional, Health Advocate and Scholar CanMEDS competencies in anesthesia residents using a Generic Integrated Objective Structured Assessment Tool (GIOSAT) during simulated scenarios.

Methods

Twenty one anesthesia residents participated in managing two scenarios: “do not resuscitate” and “morphine overdose”. Four trained blinded raters analyzed video recordings using the GIOSAT. Internal structure was examined using generalizability analysis.

Results

Results of the g-study focused on PHAS and ME components alone, participants accounted for 20% of the scores variance (G-coefficient 0.66). A D-study indicated two raters and eleven or more scenarios would be required for a G-coefficient > 0.80 .

Conclusion

This study demonstrates construct validity for assessing PHAS competencies for low stakes assessment. Results address the gap of assessment performance for PHAS competencies, describe methodology and produce recommendations for summative assessments using simulation.

INTRODUCTION

Medical education has traditionally been centered in the acquisition of knowledge and clinical or surgical skills. However, societal concerns regarding patient safety, accountability and scrutiny of professions has increased the public's appreciation for other competencies of physicians, including non-technical or so-called "intrinsic" competencies. Different initiatives have addressed these non-technical competencies for physicians, including the CanMEDS framework developed by the Royal College of Physicians and Surgeons of Canada (RCPSC) (Frank, 2005), the Accreditation Council for Graduate Medical Education (ACGME) competencies in the USA (Swing, 2007), and the General Council Competencies in the United Kingdom (General Medical Council, 2013). Although those frameworks are not identical, competencies in each one can be mapped and overlapped with each other (Norcini, Holmboe, & Hawkins, 2008). This new approach in medical education has led to a new focus on Competency Based Medical Education (CBME). Implementation of CBME has not been easy. Lack of assessment strategies and benchmarks for defining competency have been important barriers (Carraccio, Wolfsthal, Englander, Ferentz, & Martin, 2002).

The RCPSC led the identification of generic competencies common to all specialties, described as physicians' roles, proposing "The Canadian Medical Education Directives for Specialists (CanMEDS) Physician Competency Framework". In this framework, Medical Expert (ME) is central, with six other overlapping competencies around it: Communicator, Collaborator, Manager, Health Advocate, Scholar and Professional. Post-graduate training and assessment for medical residents in Canada are aligned along the CanMEDS framework competencies (Frank, 2005)(Fig 1). It should be noted that the CanMEDS terms "roles" and "competencies" are often used interchangeably throughout the literature.

The Medical Expert Competency

In the CanMEDS 2005 physician competency framework (Frank, 2005), ME is the first role - defined as a physician who integrates all CanMEDS roles applying medical knowledge, clinical skills, procedural skills, and professional attitudes, which are directed towards effective patient-centered care. The ME integrates, collects, interprets and applies information to make appropriate clinical decisions, and carry out diagnostic and therapeutic interventions.

The Six Intrinsic Competencies

As suggested by Sherbino et al. (Sherbino, Frank, Flynn, & Snell, 2011), CanMEDS competencies other than ME will be referred to in the current manuscript as Intrinsic Competencies. As *Communicators*, physicians effectively facilitate doctor-patient relationship and dynamic exchanges that occur before, during and after the medical encounter. Physicians enable patient-centered therapeutic communication through shared decision making and effective dynamic interaction with patients, families and other care givers. Effective communication is critical for optimal patient outcomes. As *Collaborators*, physicians effectively work within health care teams to achieve optimal patient care. Collaboration is increasingly important in the modern multi-professional environment, where the goal of patient centered care is widely shared. As *Managers*, physicians are integral participants in health care organizations, organizing sustainable practices, making decisions about allocating resources and contributing to effectiveness of the health care system. As *Health Advocates*, physicians are responsible to use their expertise and influence to advance the health and well-being of individual patients, communities, and populations. As *Scholars*,

physicians demonstrate a lifelong commitment to reflective learning, as well as the creation, dissemination, application and translation of medical knowledge. As *Professionals*, physicians are committed to the health and well-being of individuals and society through ethical practice, profession-led regulation, and high personal standards of behavior (Frank, 2005).

Assessment in Competency Based Medical Education

Assessment of competency is an integral part of CBME. The RCPSC states that medical residents must be prepared to fulfill all CanMEDS competencies and all competencies must be equally emphasized and taught. (Verma, Banack, Bandeira, Blouin, Buckley, Flynn & Frank, 2008). Medical knowledge has traditionally been assessed by written exams, which can be highly reproducible and valid. However, concerns have been raised regarding what the physician is actually able to do in practice as opposed to simply what they know, which led to the development of performance assessment tools, such as the Objective Structured Clinical Examination (OSCE). OSCEs focus on assessing communication and physical examination skills, and more recently other aspects have been added in an attempt to assess other competencies, mainly communication and interviewing skills. OSCEs produce reliable results when basic clinical skills are assessed. However, when more complex skills are assessed they become less reliable (Hawkins & Boulet, 2008). These complex skills correspond to intrinsic competencies while Professional, Health Advocate and Scholar (PHAS) have been less studied in performance assessments. Other assessment methods such as direct observation, portfolios and 360-degree evaluations have attempted to address the issue of assessing less well studied aspects of intrinsic competencies (Verma, Bandiera, Sherbino, & Frank, 2006).

Assessment of the Professional Competency

The Professional competency has been taught using structured curricula with lectures, readings, discussion groups and rounds (Cruess, Cruess, Kearney & Snell, 2008); however, a great part of the learning process occurs on a daily basis with clinical exposure. This learning process with role model experience from staff, senior residents and other health care professionals may show positive or negative behaviors and has been called the “hidden curriculum” (Hafferty, 1998). Moreover, unprofessional behavior has been demonstrated to cause impaired teamwork, medical errors and adverse events (Bahaziq & Crosby, 2011). It is not realistic to learn how to manage challenging situations and difficult clinical decisions with lectures, readings and random clinical experience (Gaba, 1992). Published methods for assessing these competencies, however, show limited evidence of construct validity (Dorotta, Staszak, Takla, 2006; Frank & Langer, 2003; Okuyama, Martowirono, 2011; Ponton-Carss, Hutchison, & Violato, 2011; Cruess, McIlroy, Cruess, Ginsburg, & Steinert, 2006). Lynch et al. performed a review of the literature of 191 articles relevant to assessing professionalism. They found that 49 studies looked at ethical reasoning, only 27 attempted to measure more than two elements of professionalism, and most of those were based on self-assessment and delayed recall (Lynch, Surdyk, & Eiser, 2004). Less than one third reported on the reliability of their studies, which varied widely. The majority of the studies were self-assessment questionnaires rather than performance based assessments. The performance-based assessments had a much lower level of reliability. Lynch et al. suggested a need to develop more longitudinal and performance-based assessments.

Assessment of the Health Advocate Competency

Health Advocate is a competency unique to the relatively new CanMEDS framework, which presents similar challenges as the Professional competency but with much less research into its teaching and assessment (Verma , Banack , Bandeira , Blouin , Buckley , Flynn , Frank 2008; Flynn & Verma, 2008). Verma et al. proposed that Health Advocate can be taught with didactic lectures and seminars, and evaluated by direct observation, essays, short-answer questions, multi-source feedback, portfolios and OSCEs (Verma et al., 2006). Typically simulation is used when focusing on patient safety. Since patient safety is a key element of Health Advocacy, simulation could be a powerful tool for making explicit the learning objectives and their assessment of some aspects of Health Advocacy. For the purpose of this study I focused on the Health Advocacy elements of patient safety, identifying medical errors, mobilizing resources as needed and adapting practice management to the needs of specific patients' risks.

Assessment of the Scholar Competency

The Scholar competency has traditionally been taught in lectures, critical appraisal of literature during journal clubs, and in the clinical setting by using the evidence-based practice (EBP) approach (Green, 2008). The RCPSC suggests using these tools in the assessment of the Scholar role: portfolios, short-answer questions, direct observation, in-training evaluation reports, multi-source feedback and peer assessment (Sherbino, 2006). Multiple instruments have been used to assess EBP knowledge and skills with evidence of validity, but none were performance-based such as in the management of a clinical crisis in simulation. One possible method for training the competency of Scholar during a crisis simulation is the use of

cognitive aids (reminders, such as pocket cards or handheld electronic devices). Harrison et al. found a positive correlation between the use of cognitive aids and the performance of residents managing a simulated anesthetic crisis using a checklist (Harrison, Manser, Howard, & Gaba, 2006). Bould et al. did a single-blinded randomized controlled trial on the use of cognitive aids on neonatal resuscitation. They found no significant difference between groups with or without access to a resuscitation guidelines poster, mainly because the subjects did not use the cognitive aid consistently or extensively (Bould et al., 2009). This last study supports the concept that in contrast to other disciplines such as aviation, where the use of checklists and reminders is extensive. The traditional approach for managing emergencies in healthcare relies on clinicians' ability to recall information. Memory is more prone to errors, resulting in planning and execution failures, during stressful situations. Pocket cards and handheld electronic devices are fast becoming ubiquitous and physicians are more commonly expected to use them for safer patient care. In this study, I assessed the Scholar competency by rating whether or not cognitive aids were used in two clinical simulations, specifically for resuscitation guidelines, ethical dilemmas and disclosure of adverse events.

Assessment of Competencies in the Simulation Context

Simulation-based healthcare education is a complement to bedside teaching which, in contrast with real patients, the educator gains full control of a preselected clinical scenario without the risk of distress or harm on real patients (Ziv, 2009). Simulation is a method gaining in popularity in healthcare professions, not only for teaching but also for assessment (McGaghie & Issenberg, 2009). Assessment of certain aspects of health care professionals' performance during critical situations may only be possible in a simulation environment

(Diekmann, Manser, Rall, & Wehner, 2009). Multiple assessment tools have been used in simulation (Byrne & Greaves, 2001), usually in one of two ways. In one approach, researchers have focused on the ME competencies involving medical knowledge and skills (Murray et al., 2004; Ventre, Collingridge, DeCarlo, & Schwid, 2009). In the other approach, researchers have focused on human factors for crisis resource management, which fall into the category of non-technical skills (NTS) (Flin & Patey, 2011; Kim, Neilipovitz, Cardinal, Chiu, & Clinch, 2006). Although PHAS competencies could be described as NTS, they are not explicitly identified in other fields which address performance in critical situations, where situation awareness, decision making, team work and task management are emphasized (Flin & Patey, 2011).

The GIOSAT Scale

In an attempt to integrate both approaches (ME and NTS) with the CanMEDS framework, Neira et al developed the Generic Integrated Objective Structured Assessment Tool (GIOSAT) using a modified Delphi technique involving an expert group with representation from educational psychology, simulation based education, clinical anesthesiology, critical care medicine, emergency medicine and surgical specialties (Neira et al., 2013). The GIOSAT tool is intended to measure all seven CanMEDS competencies, grouped into subscales. The ME subscale consists of eight items and the Intrinsic subscale consists of six items, one for each Intrinsic CanMEDS competency. The Intrinsic subscale can be separated into a PHAS subscale and another subscale representing the non-PHAS Intrinsic competencies (i.e. Communicator, Collaborator and Manager). Each item has abbreviated anchors and is scored with a Likert rating scale (1=very poor, 2=poor, 3=marginal, 4=acceptable, 5=good, and 6=very good) (Appendix 1 shows the GIOSAT).

Neira et al.'s study used the GIOSAT in two intraoperative Advance Cardiac Life Support scenarios (ventricular fibrillation and ventricular tachycardia). Evidence of inter-rater reliability was obtained for the ME subscale of the GIOSAT, but reliability was limited for the Intrinsic components. In terms of previously-established criteria for reliability (Landis & Koch, 1997), the inter-rater reliability for the six Intrinsic competencies was mixed – reliability for the Communicator, Collaborator, and Manager components was found to be substantial, but the reliability for the PHAS competencies was found to be only fair, and this latter group of competencies were particularly difficult to define, identify and to assess. Potential factors that could explain these results were that scenarios were too short and not designed to demonstrate the PHAS competencies. Another explanation was that the GIOSAT over-emphasized the ME component with eight items with the correspondent anchors, while the six Intrinsic competencies correspond to one item with its anchor. Finally, the raters might not have been properly trained to identify the six Intrinsic competencies. In the current study, I attempted to address this by carefully selecting and extensively training the raters in a common framework. Similar difficulties assessing Scholar, Health Advocate and Collaborator roles were found in a 10 station OSCE designed to assess multiple CanMEDS competencies in neonatal-perinatal medicine (Jefferies et al., 2007). Jefferies et al. study found high inter-station reliability and they did not find differences in scores across the CanMEDS roles, suggesting high correlation between them; however, alpha coefficients for Scholar was low (0.08), for Collaborator moderate (0.58) and for Health Advocate substantial (0.6) It is important to note that only ME and Communicator had alpha coefficients acceptable for high stakes assessment (higher than 0.8) which is in agreement with previous literature in OSCEs. Difficulties assessing medical core competencies are not

only described with the CanMEDS framework. In a systematic review of measurement of ACGME general competencies Lurie et al found that psychometric studies failed to develop measures reflecting the six general competencies in a reliable and valid way (Lurie, Mooney, & Lyness, 2009). In a study of ACGME general competencies using traditional rating forms to assess surgery residents daily, Brasel et al found that competency scores significantly correlated with the others, and all competency scores improved with the level of training (Brasel, Bragg, Simpson, & Weigelt, 2004). Although Brasel study was not performed in the simulation context, it supports that competencies improve with the level of training and that they correlate with each other.

Validity

Current standards refer to validity as the degree to which evidence and theory support the interpretations of test scores entailed by proposed uses of tests (American Educational Research Association, American Psychological Association, 1999; Cook & Beckman, 2006). As defined by the AERA, APA, NCME (1999) and others (Cook & Beckman, 2006; Downing & Haladyna, 2009a). The five categories of validity evidence are as follows: *content, response process, internal structure, relations to other variables, and evidence based on consequences of testing.*

Content validity is the relationship between the test and the construct of interest; in this study content relates to the representativeness of scenarios to the selected PHAS domains

Response process is defined as “evidence of data integrity such that all sources of error associated with test administration are controlled or eliminated to the maximum extent possible”.

Internal structure relates to the psychometric characteristics of the examination such as reproducibility and generalizability (Axelson & Kreiter, 2009). Reliability refers to the reproducibility of the scores in a test: high reliability indicates that if the test is repeated examinees would have equivalent scores. Classical test theory (CTT) assumes that all measures are prone to some level of error. The variance of repeated measures around a person's mean score is referred to as error variance. Observed score is the result of true score plus error.

$$\text{Observed Score} = \text{True score} + \text{Error}$$

Reliability is the ratio of true score variance divided by the sum of true score variance plus error score variance. In observation-based assessments each rater must score consistently and in a manner comparable with other raters. Scoring guidelines and rubrics are useful to improve inter rater reliability. Different methods have been described to estimate inter rater reliability.

$$\text{Reliability} = \text{True Score} / \text{True Score} + \text{Error}$$

$$\text{Reliability} = \text{True Score variance} / \text{True Score variance} + \text{Error variance}$$

The first method is consensus estimate, which examines exact agreement by raters. Cohen developed Kappa statistics to estimate systematic agreement attributable to chance. It is calculated by subtracting the expected value of random occurrences of agreement from the total observed instances of agreement (Axelson & Kreiter, 2009). According to Landis and Koch (1997) Kappa values of 0.2 to 0.4 are considered fair, 0.41 to 0.6 moderate, 0.61 to 0.8 substantial, > 0.81 almost perfect (Landis & Koch, 1997).

The second method to estimate reliability is consistency, which focus on raters' correspondence of similar ordering of observing performances. Statistical tests used for consistency estimates are: Pearson's r , Spearman's ρ , and Cronbach's α . Pearson's and Spearman correlation are limited to pairwise comparison between raters. To assess correlation of more than two raters Cronbach's α is preferred. The α indicates the average (true score) variance in the ratings (Axelson & Kreiter, 2009).

The third method to estimate reliability is based on using all information from judges' rating in a model and providing statistics related to the various facets of the ratings. Examples of this model are generalizability theory (G theory), principal components, and many-facets Rasch model. In contrast to CTT, in which systematic variation is only attributable to variation in true scores, G theory allows the examination of multiple sources of error (Axelson & Kreiter, 2009).

$$\text{Observed Score} = \text{True Score} + \text{Error}_1 + \text{Error}_2 + \text{Error}_3$$

$$\text{Reliability} = \text{True Score} / \text{True Score} + \text{Error}_1 + \text{Error}_2 + \text{Error}_3$$

G theory is based on the statistical method of analysis of variance (ANOVA) (Brennan, 2001a). In the G theory the examinee is the object of measurement and is referred to as person or participant (p). The condition of measurement represents how the data were collected. Facets represent sources of systematic error. In the simulation context in this project, facets correspond to raters, scenarios and competencies. Depending on the model design, participants, scenarios and raters may interact differently. If all participants perform all scenarios and all raters judge all participants the model is completely *crossed* and is expressed as $\{p \times s \times r\}$. A variation of the model in which all participants perform all

scenarios but the raters are grouped to score only one scenario is called a nested design, and is expressed as $\{p \times (r: s)\}$. G theory consists of two components: the G study and the D study (Kreiter, 2009).

The primary outcome of the G study is the variance component (VC), which estimates the magnitude of variability of each effect in the G study model and the interactions between them. The output of the G study contains five columns: effect, degrees of freedom, variance component, standard error and percent of variance.

A decision study (D study) provides reliability estimates for the scores collected in the G study and for hypothetical variations in the design to address the question of how to best optimize test design. D study uses VCs from the G study to estimate reliability coefficients given variations in the conditions of measurement. D study helps researchers determine how best to structure and operate future versions of the test (Kreiter, 2009).

I used generalizability analysis for the reasons explained above to analyze sources of systematic variance components (G-study) and to optimize future test design for PHAS competencies. This topic will be expanded in the methods section.

Relation to other variables refers to the correlation with scores from another instrument assessing the same construct or outcome for which correlation would be expected (Cook & Beckman, 2006).

Consequential validity refers to the impact on examinees from the assessment scores, decisions, and outcomes and the impact of assessment on teaching and learning (S. Downing & Haladyna, 2009b).

Validity Evidence in Simulation Assessment.

During the development of the GIOSAT, a literature review focused on assessment tools for crises simulation was performed. Although the 18 selected studies had elements of validity evidence, these elements were generally not explicitly presented according to current standards. Relations with other variables were mainly reported with the correlation between scores and level of training. Response process was not reported in 22% of the selected studies, and consequences was not reported in 72 % of the selected studies (Neira et al., 2013). None of the reported studies focused on the assessment of the PHAS competencies.

In a systematic review of validity evidence of technology enhanced simulation to assess health professionals, Cook et.al. analyzed 417 studies and found the majority of studies (85%) focused on surgical skills with only 7% of the studies focused on NTS (Cook, Brydges, Zendejas, Hamstra, & Hatala, 2013) The authors found that 48% (N=200) of the studies reported less than 2 sources of validity evidence. Eighteen percent of studies used the “classical” validity theory framework (content, criterion and construct), while only six studies presented the current unified evidence oriented framework. Twenty five percent of studies reported reliability as inter-rater reliability. They also reported multiple methodological problems in the studies. Over half of the studies (N=225) were single group, single assessment; and one third were one group pretest-post-test or crossover design. Human raters were involved in 159 studies, and only 42% of studies had raters blinded to trainee experience. Twenty three studies (14%) had only one rater. Raters’ training was reported in 42% of the studies. Only 38 studies reported a sampling strategy, with only 19 (9%) reporting sample size. The authors concluded that they identified a preponderance of evidence for relation with other variables (relations with training status) and relatively lack of

evidence for all other current sources of validity evidence. The authors suggested improvements in methodology and reporting for future studies in simulation assessment.

Simulation in Healthcare

Simulation in health care is increasingly used for education, training, research and performance assessment in different professions, specialties, and at various levels of experience (Diekmann et al., 2009; Seropian, 2003). Simulation refers to artificial replication of sufficient elements of a real-world domain to achieve a stated goal (Rall M, Gaba DM, Howard SK, 2010). In health care, simulation is the artificial recreation of a clinical environment or circumstance for the purpose of allowing a learner to undertake a specific task in a controlled manner that presents no risk to patients (Bandiera, Sherbino, Frank, & Naik, 2006). The simulator provides the physical representation (e.g. the manikin or screen) that allows the users to interact with the simulation mechanism (e.g. the simulator operator or the software) (Diekmann et al., 2009). Low fidelity simulators are designed to focus attention of the participant on a particular task, and usually refers to part task trainers such as arms, heads and manikins to practice intravenous access, airway management or to practice basic cardiac life support. High fidelity simulation, also referred as full-scale simulation, mainly refers to life-sized computer controlled manikins that have many features allowing them to react to treatments in a similar way as actual patients would (e.g. breathing, circulation, movement, occasional blinking eyes and pupil changes). Full-scale simulation intends to create an environment that gives the participant a heightened perception of the reality; to do so the simulation lab can be transformed to an operating room, intensive care,

emergency room, etc (Seropian, 2003). Full scale simulation is highly demanding in resources. It ideally requires a simulation lab with a simulation room that can be converted in different settings (hospital bedroom, emergency room, operating room, etc); a control room for the instructor and the operator (person controlling the manikin computer and the audiovisual system), and audiovisual system with recording capabilities (Seropian, 2003).

A simulation setting is defined as a spatiotemporally and socially limited event, during which humans interact in a goal-oriented way with each other, a simulator, and other equipment for different purposes. A simulation scenario is an experience episode, designed around a specific problem or a task using the patient simulator, the simulation room, medical equipment, role players, etc. During simulation scenarios, participants actively treat the manikin as a patient during challenging situations (e.g. emergencies, complications, and incidents). Scenarios are often video-recorded and discussed afterwards during the so-called debriefing (Diekmann et al., 2009).

Diekmann (2009) describes seven modules in a simulation setting (Diekmann, 2009). The first module is setting introduction. Participants receive information about the objectives of the course, simulation-based training, and logistics. The second module is simulation briefing. In this module participants receive information and hands-on demonstrations about the simulator and how to use it. The third module is theory input. In this module participants receive specific information on the content of the course, e.g. non-technical skills, medical algorithms, and medical treatments. The fourth module is scenario briefing. In this module participants receive information about the simulation scenario: clinical history, environment (emergency room, operating room, medical floor, etc), other people involved in the scenario, and the role they will play. The fifth module is the

simulated scenario. Scenario provides the controlled experience with the learning objectives that will be debriefed later. The content, length of the scenario, participants (including actors), and settings are controlled by the instructor from the control room. The instructor uses inter-communicators to control actors' conversations and behaviors from the control room. The sixth module is the debriefing. It has been considered the most important part of the simulation experience. Debriefing often uses video records from the simulation session to guide the reflection and discussion of the experience. It takes place in a debriefing room where the facilitator (instructor) guides the participants to analyse and discuss actions and mental models of the performance. Different strategies have been proposed to highlight strengths weakness and learning points. The seventh module is ending. In this module participants summarize the learning points and reflect how they would apply them to their practice. Participants may receive key articles or reading material from the facilitator.

Summary of previous literature on performance assessment and focus of the current study

Previous literature on physicians performance assessments using OSCEs have failed to include most of the Intrinsic competencies with exception of Communicator and some aspects of Professional (Hawkins & Boulet, 2008). This construct underrepresentation could be explained by the relatively new development of the CanMEDS and other competency based frameworks. Medical education continues to be concentrated in medical knowledge and clinical skills, and there is an urgent need of curriculum development and valid performance assessments for the Intrinsic competencies (Carraccio et al., 2002). Even more,

previous literature also consistently show limitation in reliability of the assessments of PHAS competencies (Cook et al., 2013; Jefferies et al., 2007; Lynch et al., 2004; Neira et al, 2011; Ponton-Carss, Hutchison, & Violato, 2011b;). One possible explanation for the limited reliability on the PHAS competencies assessment, not related with the content of the stations, is that raters may not be properly trained to assess those competencies and that the assessment tools may not have been designed for this purpose. In the present study, I address the previously mentioned issues regarding validity of PHAS competencies assessment using simulation. I took into account current theory on validity evidence as a framework to design a simulation encounter focused on assessment PHAS CanMEDS competencies. The first source of validity evidence is content. Content of the simulated scenarios followed a rigorous process to make it focused in the PHAS competencies with the collaboration of content experts and anesthesiology staff, and literature review. Actors training was also extensive. The response process was carried out by revising the assessment tool making it focused in the PHAS competencies, and developing rubrics and raters' rules. Intense rater training was also performed. The internal structure was analyzed with generalizability analysis which provides information regarding reliability, analyses different sources of systematic variation of scores, and also provides recommendation for future designs. Relation to other variables was analyzed correlating scores with PGY, and PHAS scores with other GIOSAT subscales. Finally, consequences of this assessment was low stakes since the study was not part of a formal OSCE and the focus was to explore the use of simulation to assess performance of PHAS competencies to propose recommendation for future higher stakes assessments.

OBJECTIVE:

The objective of this study was to demonstrate validity for a revised GIOSAT assessment tool focused on PHAS competencies when examining anesthesia residents during clinical crisis simulations.

HYPOTHESIS:

I hypothesized that by refining and controlling the content of the scenarios for PHAS competencies, as well as the response processes associated with the assessment tool (revised GIOSAT) (including rater training, development of scenario specific rubrics and raters rules), anesthesia residents' scores would demonstrate a reliability greater than 0.7. This reliability coefficient was selected based on previous studies on OSCE examinations assessing non-clinical competencies and taking into consideration the difficulties assessing PHAS competencies from my previous study (Neira et al., 2013). This level of reliability could be considered acceptable for low stakes and formative assessments (S. M. Downing, 2004). I also hypothesized that PHAS scores would correlate positively with post-graduate year of residency (PGY) and with other CanMEDS competency scores.

METHODS

As shown in Figure 2, this study was a single blind prospective correlational study with the objective of demonstrating construct validity for the assessment of the PHAS competencies using simulation. The simulation encounters followed the typical modules described in the introduction. The teaching and learning experience was planned and performed after each simulation session during the immediate debriefing. Content experts in

professionalism (JM) and in health advocacy (AN) were debriefing facilitators in the scenario 1 (do-not resuscitate) and scenario 2 (morphine overdose) respectively.

Procedure:

This study was approved by the Ottawa Hospital Research Ethics Board (Appendix 2). Anesthesiology residents post-graduate years 1-6 from the University of Ottawa and Queens University rotating in Ottawa were invited to participate in two simulated medical scenarios. Informed consent was obtained to video record their performances and have them analyzed as part of this study (Appendix 3). Residents were asked to sign a confidentiality agreement regarding the scenario content information (Appendix 4). All participants received orientation about the simulation session. Participants were encouraged to manage the manikin and the situation as in the real life with them acting as the team leader. After the orientation session demographic information was obtained and the participant was directed to the simulation lab. Basic introductory information regarding the scenario was provided with a card taped at the door of the simulation lab. Once the participant had read the card, they were asked if they had any questions; questions or concerns were solved and finally the emergency call was over headed and the participant entered to the simulation lab to start the simulation performance. While the participant was signing the consent form, the confidentiality agreement and receiving orientation from the research assistant, the principal investigator (PI) checked that the simulation settings were working properly. This checking included: simulation room, manikin, monitors, actors, inter-communication equipment, audiovisual recording system, control room, technician and expert content present in the control room. The duration of the simulation was 10 min. The content of the scenarios is explained in the content validity section. Actors performed as health care professionals or

family members depending on the scenario, and they were instructed to help and perform actions when directed by the participants, but not offer advice or prompting the medical and non medical objectives of the scenario. The PI controlled actors' conversations and behaviors from the control room. Most participants performed scenario 1 first followed by the debriefing session and then the second scenario. The order of the scenarios was not controlled by the investigator as this was assigned by the research assistant depending on the schedule available for the participants and actors. Content experts provided immediate feedback during debriefing sessions using a previously described technique (Rudolph, Simon, Rivard, Dufresne, & Raemer, 2007). Participants' completed a feedback form at the end of the encounter (Appendix 5). After a short break, participants were oriented to the second scenario following the same steps described previously.

Study participants and setting:

PHAS study simulations and video-recordings were performed from August to December 2012. Video editing and raters' training was performed from November 2012 to February 2013. Ratings were performed from March to April 2013. Analyses were performed from May to July 2013. The participants of this study were post-graduate year (PGY) 1 to 6 anesthesia residents. The sessions were conducted at the University of Ottawa Skills and Simulation Centre at The Ottawa Hospital Civic Campus.

Sample size:

Adequate sample size was determined based on previous studies using the GIOSAT for assessing non-technical skills with inexperienced participants during simulated crises

(Neira et al., 2013). In the current study the null hypothesis was that the Pearson correlation coefficient would be less than 0.70. In keeping with previously published papers,(Brannick, Erol-Korkmaz, & Prewett, 2011) we chose 0.7 as the value for our alternative hypothesis, which would provide sufficient evidence of reliability for possible adoption of this instrument for assessment of non-clinical competencies in an OSCE format. Based on these values and using the method recommended by Cohen (Cohen, 1988) on correlation values using four raters, we calculated the sample size required for power of 0.8 to be $n = 35$. We planned to enroll 40 residents to ensure adequate power in the event of potential attrition or technical problems.

Validity

Content validity:

Simulation Scenarios: Scenarios were selected and developed following a previously published process shown in Fig 3 (Hamstra, 2012). Topics related to PHAS competencies relevant to anesthesiology were presented at different department meetings where senior staff and medical education researchers provided their input. Content experts selected key topics related to PHAS competencies. Selected topics related to the Professional competency were honesty, empathy, respect, awareness of ethical and legal codes, disclosure of error or adverse events (Morrison et al., 2010; Burkle, Mueller, Swetz, Hook, & Keegan, 2012; Disclosure working group, 2011). Topics related to Health Advocate were patient safety, formulation of a prevention plan, initiate discussion with other team members about medical error and omissions, recognize and address medical errors and omissions (Tallentire & Smith, 2012). Scholar topics were demonstration of teaching skills with health care

professionals, students and patients, demonstration of evidence based medicine, and effective use of cognitive aids (Makoul, 2002). A literature search with the topics mentioned above to identify case reports, and scenarios already designed and validated in simulation studies was performed (Syed, Paul, Hueftlein, Kampf, & McLean, 2006; Overly, Sudikoff, Duffy, Anderson, & Kobayashi, 2009).

A series of potential scenarios was developed addressing these key PHAS topics. Potential scenario content and difficulty was also discussed at department and education research meetings. Two scenarios were selected: Do not resuscitate (DNR) and morphine overdose (MOD) with disclosure. Computer based manikins and actors were used to create the simulated clinical immersion. Working with content experts, I developed narrative and scripted versions of the scenarios with optimal and suboptimal predicted examinee performances. These were then enacted and video-recorded for the purposes of training actors and raters (See Appendix 6 and Appendix 7).

The DNR scenario (Appendix 6) involves a 65-year-old female who arrested in a coffee shop outside the hospital. She was rescued by paramedics who performed cardio-pulmonary resuscitation (CPR). The patient just arrived to the emergency room where a junior physician is performing chest compressions with poor technique, the respiratory therapist is not performing respiratory support, and the nurse only has information from the paramedics that they applied the automatic defibrillator and shock was not advised. The participant is expected to recognize asystole as the diagnosis, correct the bad chest compression technique, initiate ventilatory support (hand and bag ventilation), give medications (epinephrine), intubate and look for more information to explain the poor response to treatments. The patient has a DNR bracelet on the right wrist, and a signed letter

and a card with DNR directives in her purse. She also has a medication list and two identification cards. The Advanced Cardiac Life Support (ACLS) guidelines are available for the participant at the bedside table. Once the participant finds the DNR directives, he/she is expected to confirm the patient's identity, and stop resuscitation efforts. An emergency telephone is provided to explore the decision-making process regarding discontinuation of CPR efforts, which include asking a family member to confirm identity and the DNR directives. Immediate debriefing was provided by a content expert focused on ACLS resuscitation guidelines and ethical decision with DNR directives (Neumar et al., 2010b; Morrison et al., 2010).

The MOD scenario (Appendix 7) is a 15 year-old boy in the 6 h post-operative period of anterior cruciate ligament reconstruction receiving morphine infusion with a patient controlled analgesia pump (PCA). The patient was found unresponsive with severe bradypnea (6 breaths per minute), cyanotic, bradycardic (heart rate of 50 bpm) and hypotensive (BP 80/50 mm Hg). The respiratory therapist is assisting the respiration with handbag and mask with improvement in the oxygenation. The mother is present and is very anxious, uncooperative and emotional. The nurse is also present. The participant is expected to ask for information about the case, examine the patient, control the disruptive behavior of the mother, diagnose morphine overdose with differentials, order investigations, and start treatment with naloxone 2 mcg/kg according to the pre-printed orders from the chart. The nurse will respond that the PCA pump shows 2 morphine boluses of 10 mg each in 1 h, which confirms the diagnosis of MOD. The patient responds to treatment and wakes up in pain. The participant must formulate the pain control plan, and investigate the reason for the overdose. The nurse informs the participant that the mother is very upset and that she wants

to speak to him (her). The participant is moved to an office to prepare the disclosure to the mother. Participants had 10 minutes preparation time with the patient's chart, disclosure guidelines placed in an evident location and a phone with the Medical Protective Association phone number. The disclosure meeting with the mother follows and it is used to rate communication and professional competencies in the modified GIOSAT. Immediate debriefing was provided focused on medical errors with opioids overdose and disclosure guidelines (Syed et al., 2006; Souter & Gallagher, 2012; The Canadian Medical Protective Association, 2008)

Revision of the GIOSAT instrument:

The GIOSAT was reviewed by content experts and expert raters to target key elements of PHAS competencies in the context of specific simulation scenarios (Appendix 8). PHAS-focused analytic rubrics were developed by content experts and revised by health care education experts and researchers for consistency and content (Appendix 9). Disclosure was considered a key element of the Professional role because it has recently received great attention by the public and patients (Disclosure working group, 2011), medical insurers (The Canadian Medical Protective Association, 2008), hospitals (Ottawa Hospital, 2008), and medical educators (Fein et al., 2007). A well recognized six step protocol was used for delivering bad news, better known by the mnemonic "SPIKES" (Settings, Perception, Invitation, Knowledge, Emotions), described initially for oncology patients as a framework to provide disclosure in the MOD scenario. (Strange Khursandi, 2011; Baile et al., 2000). PHAS analytic rubrics needed to be expanded for disclosure using the SPIKES protocol integrating it into the recommendations from the Canadian Medical Protective Association

and the Canadian Patient Safety Institute (Appendix 10).(Disclosure working group, 2011; The Canadian Medical Protective Association, 2008)

Response process:

Actors' selection and training: Actors were used to simulate the clinical scenarios, and represented the roles of nurse, respiratory therapist (RT), emergency doctor, and family member. Actors were selected according to the needs of each scenario, trying to reflect current practice and expectations of the participants as follows.

Scenario 1: (DNR) Three actors participated in this scenario.

1. Respiratory therapist (RT): a retired respiratory therapist who works at the simulation center, performed the majority of the scenarios. He was not available for four simulations and one anesthesia fellow took his place.
2. Registered nurse (RN): a retired recovery room nurse volunteered to perform as a nurse in the scenarios.
3. Junior physician: an anesthesia fellow and an international medical graduate doing a masters degree in education interested in working in simulation participated as a junior physician on call during the resuscitation.

Scenario2: (MOD) three actors participated in this scenario.

1. Respiratory therapist (RT): a retired respiratory therapist who works at the simulation center, performed the majority of the scenarios. He was not available for four scenarios, and an anesthesia fellow took his place.

2. Registered nurse (RN): a pain nurse practitioner that works at the department of anesthesia volunteered to perform as a nurse in the scenario.
3. Patient relative (mother): an international medical graduate with one-year experience as actor at the simulation center performed as the mother of the patient.

The PI and the experts in content (AN and JM) trained the actors. Actors received the content of the scenarios in narrative and the scripts with the potential conversations from participants: novice with expected poor performance and proficient/expert: good to very good performance, one week in advance to the first actors' training session. Two full days were reserved at the uOSSC to train the actors and pilot the scenarios. The first day actors received a lecture regarding the CanMEDS, the GIOSAT scale and the project. Questions and concerns were solved. DNR scenario was performed and recorded seven times. MOD scenario was performed and recorded eight times, and the disclosure part five times. The PI performed as junior or senior trainee and AK observed and provided feedback to the participants. The whole group watched the video records and areas of improvement were identified. Scenarios were repeated until actor's performances were consistent to the planned scripts, content and approved by the investigators. The two days at the uOSSC were not enough to provide confidence to the actors and consistent performances, so an additional full simulation day was required and performed at the simulation laboratory at the Children Hospital of Eastern Ontario. The PI, the content_expert, and the actors were satisfied with the performances. Video records demonstrating poor and good performances for each scenario and consistent performances from the actors were selected to train the raters.

Raters' selection and training: Staff anesthesiologists involved in simulation education from different universities, who were blinded from resident's identity and level of PGY were invited to participate in the study. Anesthesia simulation educators from the University of Toronto (one from St. Michael hospital and two from the Sick Children Hospital) and one from the University of Alberta accepted the invitation.

The content of the scenarios, the GIOSAT, and analytic rubrics were sent to the raters two weeks before to the first training session. The first training session was performed in a face to face session during the 2012 simulation summit conference in Nov 17th 2012. The session consisted in two parts. The first part was 20 minutes a lecture about the objectives of the project and the content of the GIOSAT, the analytic rubrics, and the scenario content. The second part was a raters training using pilot videos with optimal and suboptimal performances. There were concerns from the raters regarding when to take the decision to stop the resuscitation efforts in the DNR scenario and the SPIKES content in the rubric of the disclosure part of the MOD scenario. There were also concerns about how to rate borderline performances, which were not showed in the pilot videos. The decision was to develop raters' rules and to organize another rater training session via videoconference. Raters' rules were developed by iterative process with the participation of the expert content and the raters, until obtaining consensus (see Appendix 11 and 12). Raters' rules were intended to guide the distinction between borderline performances. Descriptors of marginal (GIOSAT score 3) and acceptable (GIOSAT score 4) performances were developed for each scenario. A clarification was included indicating that the rules were not a guide to specific scores, they were more score limiters. The presence of the example behavior in the column marginal, do not necessarily score 3; they just cannot score higher than 3. Similarly if the

participant displays behaviors in the acceptable column, they do not necessarily score 4, they just cannot score lower than 4. Raters were encouraged to use the full range of the scale.

The second raters' training session was performed via a videoconference in February 2013. Differences in ratings, questions and concerns were discussed until consensus was reached. Once the raters felt comfortable with the content and use of the scale, they assessed residents' videorecordings independently. Resident's video performance recordings were stored in a password protected computer system. The PI sent to the raters a package containing a password protected memory stick with encrypted video records, 50 copies of the GIOSAT, analytics rubrics and raters rules, and a pre-paid envelop to return the GIOSAT forms for analysis and documentation. Raters independently analyzed the video records. Agreement was obtained from the raters to maintain confidentiality and to return or destroy the videos once they finish their rating.

Internal Structure:

A *Generalizability study* was performed to analyze global reliability and the variance components (VC) of the various conditions of measurement (facets) (Kreiter, 2009). The participating residents were the object of measurement (p). Other conditions of measurement represent facets: four raters (r), two scenarios (s) (DNR and MOD) and two competency subscales (c) (Intrinsic and ME). Facets were identified as the main source of variation. I analyzed the main effects of the object of measurement (p) and each facet: r , s , and c and the interactions between them: ps , pr , pc , sr , sc , rc , psr , psc , prc , src , $psrc$. VCs are described by coefficients and as percentages of variance components (%VC). Similar

analyses were performed using the PHAS subscale instead of the Intrinsic component (i.e. PHAS and ME).

A *decision study (D-Study)* was conducted to estimate how many of each facet would be required to obtain a particular reliability. A *D Study* addresses the question regarding how to optimize test design. VCs of the *G study* were used to calculate estimated reliability coefficients given variation in the conditions of measurement. A *G-coefficient (G)* was calculated as a measure of reliability (reproducibility of residents' scores). I estimated the reliability of the test with the observed conditions (2 scenarios, 4 raters and 2 competencies) and also using any numbers of scenarios and raters. The generalizability analysis was performed using G-String and UrGenova software (Brennan, 2001; Bloch & Norman, 2011).

Relations with other variables:

The independent variable was PGY of residency and the dependent variables were ME, Intrinsic, PHAS, non-PHAS Intrinsic and GIOSAT scores. In comparing relations with other variables, I averaged scores across the four raters, two scenarios, and where applicable across subscales. The Primary outcome for this analysis was the correlation between PHAS scores and PGY level, as measured using *Pearson's correlation coefficient (R)*. The Secondary outcomes were correlations between PGY level and ME, Intrinsic and GIOSAT scores. I also correlated PHAS scores with the other Intrinsic competencies (Communicator, Collaborator and Manager), ME and GIOSAT scores excluding PHAS using Pearson's correlation coefficients.

Additional Observations and Comparisons:

I also examined the decision making approach to discontinue resuscitation in the DNR scenario and the preparation for disclosure in the MOD scenario.

Participants were invited to complete a feedback form at the end of the sessions. The feedback form asked questions regarding realism of the scenarios, quality of the debriefing, knowledge acquired, confidence in managing similar situations in the future, and general satisfaction with the encounter. A five point Likert scale was used (strongly disagree to strongly agree). Results are described in percentages.

Statistical Analyses:

To examine the differences between the two scenarios, comparison of GIOSAT scores and competency subscale scores were analyzed with *Student's t test*. P values < 0.05 were considered significant. SPSS version 21 (SPSS, INC. 2012, Chicago, IL) was used for the statistical analysis.

RESULTS

Twenty two of 55 eligible residents (40%) from the Anesthesiology Residency Program at the University of Ottawa and Queens University agreed to participate in the study. The data from one participant was omitted from analysis because of failure in the video recording system. Twenty one participants completed both scenarios and had video records available for analysis. Most participants were female (62%) and from PGY 1, 3 and 4 (Table 1).

GIOSAT mean scores and standard deviations (SD) of individual scenarios and both scenarios together are shown in Table 2. Individual item mean scores were as follows: Professional (DNR 3.95 ± 1.21 , MOD $4.55 \pm .86$, average of both scenarios 4.25 ± 1.09); Health Advocate (DNR 3.86 ± 1.24 , MOD $3.97 \pm .96$, average both scenarios 3.9 ± 1.11); and Scholar (DNR 3.63 ± 1.02 , MOD $3.29 \pm .75$, average of both scenarios $3.46 \pm .91$). The other Intrinsic competency scores (Communicator, Collaborator and Manager) showed similar results: (range DNR 3.65-4.02, range MOD 3.77-4.32). ME scores were slightly lower (3.03-3.92) except for DNR medical therapeutic, MOD situation awareness and procedure therapeutics (4.02-4.24).

Internal Structure

There were significant moderate correlations (.46-.53, $p < .05$) between scenarios in GIOSAT scores and subscales (Table 3). Results of the G-study with the average of Intrinsic, and ME scores are shown in Table 4. Participants (p) (residents) was the most important VC accounting for 23% of variance. Scenario (s) did not account for any variability but there was some variability attributed to the interaction of p and s (ps VC 14%), which

indicated that there were some differences between participants as a function of scenario. Effects involving competency tended not to account for much variability, suggesting that the competency scores are highly correlated with each other. The *G-coefficient* for the scale using average scores from four raters, two competencies and two scenarios was 0.64.

A decision study (*D-Study*) was conducted to estimate how many of each factor would be needed to estimate a particular reliability (*G-coefficient*). Given that p_s is bigger than p_r and p_c , scenario interactions contributed more to the VC, so manipulating s had a larger effect on the reliability of the instrument than manipulating the number of raters. Table 5 and Figure 4 display estimated *G-coefficients* that could be obtained if we varied the number of raters and scenarios. With five raters, two competencies and one scenario the inter-rater reliability would be .50 and with two scenarios .66. We would need eight scenarios using two raters and two competencies to obtain .80 reliability.

Another *G-study* using PHAS scores rather than intrinsic scores was performed. Note that one participant was removed from the analysis because of incomplete data to generate PHAS scores. Results were similar to the previous analysis (Table 6). Participant accounted for 20% of VC. The *G-coefficient* for the scale using the average score from four raters, two competencies and two scenarios was .66. Results from the *D-study* assuming two competencies are displayed in Table 7 and Figure 5. With two competencies and one scenario the inter-rater reliability would be .46 and with two scenarios it would be .55. We would need 11 scenarios to obtain .80 reliability using two raters and two competencies.

Relations with other variables.

The correlation between PGY level with mean scores for PHAS, Intrinsic, ME and GIOSAT were as follows. The correlation between PGY and PHAS ($R=.60$, $p=.004$), PGY and Intrinsic ($R=.65$, $p=.002$) and PGY and GIOSAT ($R=.47$, $p=.034$) were all found to be statistically significant, while the correlation between PGY and ME ($R=.26$, $p=.25$) was not statistically significant (Table 8) (Figs. 6-9). A significant correlation was found between PHAS and the other Intrinsic CanMEDS competencies (Communicator, Collaborator and Scholar) ($R=.91$, $p<.000$), ME ($R=.70$, $p<.000$), and GIOSAT scores excluding PHAS ($R=.82$, $p<.000$) (Table 9) (Figs 10-12).

Additional Observations and Comparisons:

Results regarding the decision to discontinue the resuscitation in the DNR scenario are shown in Table 10. A plurality of participants (47.6%) discontinued CPR after finding DNR directives and confirming identity. Almost a quarter of participants (23.8%) continued CPR and never found the DNR directives, about 20 % decided to call the relative or a staff member to confirm the decision, only one participant discontinued CPR because of the diagnosis and poor response to good quality CPR, and finally one participant (4.7%) only used the bracelet to take the decision of suspending CPR.

Results for the MOD scenario, regarding the preparation process for the disclosure are shown in Table 11. Most participants prepared the disclosure with only the patient's chart (71.4%), four used the disclosure guidelines (19%), one clarified information with the nurse and one called the staff. After reviewing the guidelines three participants asked the nurse to be present in the room, one of these also called for advice from the insurance company

number assigned for simulation. The participants using more resources than the chart showed higher scores in Communicator ($t=-2.54$, $(df=19)$, $p=.02$) but Professional did not reach significance ($t=-1.8$, $(df=19)$, $p=.08$) (Figs 13 and 14).

The feedback form results from both scenarios are shown in Figures 15-16. In general participants were very satisfied with the encounter and provided similar answers in both scenarios. The majority responded “strongly agree” for satisfaction, confidence, knowledge and debriefing. Most participants responded “agree” or “strongly agree” that scenarios were realistic.

DISCUSSION

Demonstration of construct validity calls for the collection of evidence from five sources: *content, response process, internal structure, relation to other variables and consequences.*

Content:

A simulated clinical encounter was designed with the objective of collecting evidence of construct validity to assess the PHAS CanMEDS using a revised generic assessment tool (GIOSAT). The *content* of the scenarios was developed selecting key elements of the PHAS competencies, a literature search for case reports and previously described scenarios or OSCEs focused on DNR and disclosure of adverse events. Scenarios were discussed in several department meetings, pilot tested with actors and evaluated by content experts. Consistency of performance by the actors was controlled by the development of a narrative version of the scenario as well as the scripts which guided the potential conversations with the participants. Actors performed pilot performances under the control of the investigator to provide consistency. The investigator controlled actors' conversations and behaviors during the performance from the control room using intercommunicators. The GIOSAT was revised to make it appropriate for the MOD scenario expanding the anchors in Communicator, Collaborator, Professional, Health Advocate and Scholar .

Response process:

Response process was addressed with pilot scenarios and rubrics for raters to facilitate consistent rating. Two sessions were required to train the raters to use the scale and resolve concerns regarding the content of the scenario and the appropriate ratings. Raters

recognized the value of their role in this process and recommended that they be involved earlier in future studies to be able to contribute in the development of the content of scenarios. Another point regarding the content was that trying to assess all CanMEDS competencies during each scenario may not be feasible, especially if the focus is just on the PHAS competencies.

Internal Structure:

Classic inter-rater intra-class correlations only take into account absolute or consistency agreement between raters. The generalizability analysis has several advantages when compared with classic methods for assessing reliability. The G-study takes into account other sources of variation such as participant, scenario, rater, competency and the interactions between them. The D-study provides information to optimize test design; these results are essential for future test planning. Reliability results with the D studies exhibited substantial range. Participants was the most important VC, while scenario and raters did not represent a significant VC. The interaction terms *ps*, *psr* and *psrc* accounted for most of the observed variance. This confirmed the finding that the scenario scores were not different from each other and they were highly correlated. The low VC of the raters suggests that the response process was adequate. Our findings are consistent with previous reports of performance assessment where variation in clinical scenario was higher than differences across judges (Boulet & Swanson, 2004).

The *D- study* using intrinsic scores estimated eight scenarios and two raters to obtain a reliability of .80. Similarly, for PHAS average scores 11 scenarios would be required. This aligns with previous recommendations for OSCE examinations, that 10 to 12 encounters with

a duration of up to 25 min each may be required to achieve minimal generalizability to support validity (van der Vleuten & Swanson, 1990).

Previous studies on reliability for the oral exam in anesthesiology found similar variation in inter-rater reliability with overall reliability of 0.65 (Kearney, Puchalski, Yang, & Skakun, 2002). Another study in surgical residents using an objective structured performance-related examination could not support reliability (Cronbach's $\alpha=0$) in professionalism (Ponton-Carss et al., 2011a). Multiple studies in Professionalism assessment have demonstrated challenges in content validity (Lynch et al., 2004; Bahaziq & Crosby, 2011). Reliability results of my study are similar to current results in the OSCE literature. Brannick et al performed a systematic review of 64 studies on the reliability of OSCEs. They found overall alpha coefficients of 0.62, and generalizability coefficients of 0.49. The mean alpha for communication scales (Likert scales) was 0.55, and for clinical scales (checklists) 0.69. Reliability increased by increasing the number of stations (>10) and with two raters (Brannick et al., 2011). Downing (2004) addresses the question of how much reliability is required to accept the assessment data with respect to the consequences of the assessment. If the test is for licensure or certification, it is considered high stakes and high consequences, and the suggested reliability is 0.9 or higher (S. M. Downing, 2004). If the assessment is for summative purposes at the end of a course, the suggested reliability would be 0.80 to 0.89. For assessments with lower consequences such as formative or summative classroom type, the accepted reliability would be in the range of 0.70-0.79. Those reliability coefficients are largely focused on ME assessment. However for more complex and less defined constructs such as the PHAS competencies lower reliability may need to be accepted until more studies improve the design of the tests and construct definitions.

One of the interesting findings from the G-study was the VC associated with *psr*. The interaction between participants, scenarios and raters accounted for 19% of the variance in GIOSAT scores. This indicates that the raters may have scored performance differently in the different scenarios. For future work, I would suggest the raters be nested within scenarios. This design would avoid the halo effect or the potential bias when the rater is judging more than one performance of the same subject. The disadvantage of the nesting designs is that we would need 2 raters per scenario and with 11 scenarios we will need 22 raters.

Relation with Other variables:

The main interest of the study was to assess the PHAS competencies simultaneously with ME during simulated scenarios. Although there are instruments designed to assess disclosure those studies did not take into account Health Advocate and Scholar competencies. The relation with other variables was studied with the correlation between GIOSAT, PHAS, Intrinsic, and ME with PGY, and also with the correlation between PHAS scores and other GIOSAT scores. One of the most interesting findings of this study was the positive correlations between PGY (level of training) and PHAS, Intrinsic and GIOSAT scores, but not with ME scores. The lack of correlation between PGY and ME could be explained by the design of the scenarios. The ME content was very basic, and it was expected that all participants would manage this part without problems, although the performances were reliably rated at a marginal level. During the debriefing participants explained their performance as affected by the non-medical content of the scenario i.e. the bad resuscitation technique in the DNR scenario and the difficult parent in the MOD scenario. Another

explanation for the ME scores is that participants did not know about the content of the scenarios in advance and they were not prepared. Despite the fact that the medical content of the scenarios was straightforward, there were elements in the scenario that required participant actions like correcting the CPR technique and asking for more information in the DNR scenario and dealing with a uncooperative parent in the MOD scenario. These elements could affect the ME performance by distracting from situation awareness and decision making. The debriefing uncovered that the DNR criteria for discontinuing resuscitation, adverse events, medical errors and disclosure are not formally taught despite the existence of clinical guidelines, and while relevant are rarely encountered in clinical practice. Those participants with previous clinical experience in adverse events and disclosure performed better than the ones without it, highlighting the inconsistency of the clinical encounters with respect to our scenarios (hidden curriculum). Sensitive topics such as end of life, DNR directives, management of medical errors and disclosure can be translated to the simulation curriculum because the experiential learning process may provide a higher impact on learning in these domains.

The significant positive correlation between PHAS scores and ME, non-PHAS intrinsic and non-PHAS GIOSAT scores confirms previous studies assessing multiple clinical competencies using OSCEs (Jefferies et al., 2007; Lurie et al., 2009). These studies also found positive correlation with the PGY of residency, suggesting that all competencies improve with teaching and clinical exposure. The raters' training and scenario design of the present study intended to focus ratings to PHAS competencies, however all our raters were clinicians and it may be difficult for them to isolate medical performance from other

domains. One option to improve this aspect is to have simulated patients or other health care professionals assessing non-clinical domains such as PHAS competencies.

Consequences:

This study can be described as low stakes assessment with an exploratory nature as explained above. Since our approach was not summative assessment the major impact on the learner was the reflection and feedback during the debriefing along with the handouts provided. The impact to the faculty was to confirm that important aspects of PHAS competencies are not part of the formal curriculum and can be taught and assessed using simulation. Faculty may consider simulation as one of the tools available for instruction and assessment for PHAS competencies, and it appears they also need training as instructors and raters to participate in simulation programs. (Ziv, 2009; (McGaghie & Issenberg, 2009)

Implications

This study was an exploratory analysis of PHAS competencies using simulation. The focus was double: assessment and teaching. The teaching aspect was performed during the debriefing with expert content directing a non-judgmental activity in which the participants reflected and discussed their performances. This approach could be considered as assessment for learning. The exploratory approach allowed us to identify lack of consistency in the teaching of PHAS aspects as well as propose topics and other aspects such as number of scenarios for future formal assessments using simulation for critical situations where simulated patients may be a limitation.

The use of simulation focused on PHAS competencies opened a new avenue to teach and assess multiple aspects of these complex domains. The design of scenarios combining

clinical and PHAS domains such as ethical dilemmas, medical errors, disclosure and difficult decision requiring access to information requires careful design, actors' training and control by the instructor. The experiential nature of the simulation may produce higher impact on learning. The consistent use of simulation for these domains may produce an homogeneous training expanding the teaching and assessing tools for PHAS competencies.

Limitations of the Study

Limitations of the study can be described in terms of the two major threats to validity: construct under-representation (CU) and construct irrelevant variance (CIV). (S. Downing & Haladyna, 2009a) CU refers to under-sampling or biased sampling of the content domain by the assessment instrument. The current study only had two scenarios, which were both focused on PHAS competencies. The *G* and *D studies* allowed for the investigation of the number of scenarios required for higher reliability. Although many other topics related to PHAS and Intrinsic competencies could have been tested with more simulated scenarios, this was limited by the cost, the availability of the simulation centre, the residents' schedule and interest in participating in the study.

Sources of CIV were addressed in the planning of the study. There were some potential sources of CIV in this study, some of which were anticipated. First, although scenario was not an important VC in the *G studies*, the content of the scenarios could have contributed to CIV. The scenarios were developed with scripts and potential responses for the actors. The rating instrument (GIOSAT) was revised and discussed with the raters who participated in the development of the rules for borderline performances. Second, the GIOSAT was designed as a generic assessment tool usable in multiple scenarios, and

specialites. Not all competencies are highlighted in all scenarios, and consequently, not all items of the GIOSAT have to be used in all scenarios. On the other hand, the GIOSAT was not designed for specific comprehensive assessments. Key elements, actions or behaviors for crisis situations were selected in the original design of the GIOSAT. Additional elements related to Communicator and PHAS competencies were added in the current study. One limitation regarding the rating is that we only used the GIOSAT as an assessment instrument; future studies comparing different scales, such as scenario specific checklist and other global rating scales, may clarify which assessment method works best. Third, there may be two aspects of CIV related to the actors. Not all scenarios were performed by the same actors, and this may have affected performance. Also, given the actors were professional health care providers and not professional actors, there may have been some limitation in their ability to accurately represent those roles. The principal investigator addressed this in advance during the training sessions with the support of content experts, who provided an external opinion on their abilities, and the training was intense, consisting of up to 9 repetitions during the practice sessions which occurred over 3 days. Finally, raters' severity or leniency is another potential source of CIV, although several steps were taken to avoid this source of bias. For instance, the raters had previous experience in assessing the performance of residents, and were all trained intensively prior to the study.

Future studies with 11 or more scenarios focused on PHAS competencies, following similar methodology may improve reliability to high stakes levels. This number of scenarios will address the CU allowing the examiner to explore more elements of the PHAS competencies. The invitation of content expert to carefully select key elements of the PHAS competencies, perform a literature review to design evidence based scenarios was very

important. The scenario design must be flexible, depending on the objectives short or long scenarios, manikin, actor or mixed may be required. The actors and raters training and their active participation in the design, performance and assessment is also essential to avoid bias and favor reliability. The assessment tools must be designed to match the objectives of the assessment and ideally must include more than one method (i.e. a checklist and a global rating scale or comparison of more than one scale). Finally the major limitation of this type of performance assessment will be the cost related to the intensity of the resources required: simulation center, manikins, actors, and raters.

The small number of participants could also be considered as a limitation of the study. The sample size calculation resulted in 35 participants and the recruitment produced 21 out of 55 potentially eligible participants (recruitment rate of 38%). The study was voluntary and not part of the formal curriculum.

Strengths of the Study

The strengths of the study were the raters, the scoring system and the raters' training. The raters were anesthesiologists with strong background in simulation education from different institution, and they were blinded from the residents' identity. The scoring system has been used previously and with the development of anchors, analytic rubrics, exemplars and scenario-specific raters' rules reliability improved. This scenario-specific approach was important in improving the reliability, given the "challenging" nature of assessing the PHAS competencies. The actors were volunteer nurses and physicians who attended most of the sessions and performed the same role consistently. Prompting from the actors was observed only in a few occasions.

Future Directions

The next steps of this project are:

1. Presentation of the results in medical education meetings. This project was already presented as poster at the International Meeting of Simulation in Healthcare in San Francisco (California) in January 2014. It has already been submitted to the 2014 International Conference in Residency Education and the Canadian Anesthesiology Meeting.
2. Publication: I plan to publish the result in a medical education journal or in a clinical journal.
3. Implementation: I would recommend the program director at the Department of Anesthesiology University of Ottawa to consider simulation to teach and assess for formative and summative purposes specific aspects of PHAS competencies in anesthesia residents. Those specific aspects could be ethical dilemmas, medical errors, disclosure of medical errors and bad news, teach other members of the health care team, search for the best guidelines to manage clinical and non clinical challenging situations and other aspects of those competencies.

CONCLUSIONS

The study demonstrates construct validity evidence for assessing PHAS and Intrinsic competencies using clinical simulation with a G coefficient of .64. Future studies with similar methodology may support construct validity at high stakes levels using two raters, eleven or more scenarios and comparison of GIOSAT scores with other assessment tools.

Aspects related to PHAS competencies included in the content of these scenarios are not part of the formal curriculum. Simulation is a powerful tool that allows us to teach and assess Intrinsic CanMEDS domains in a controlled environment that do not put patients at harm.

Simulation could be used to unmask the hidden curriculum by creating simulated clinical situations where PHAS competencies key learning objectives could be highlighted. These simulation encounters could produce a consistent opportunity to discuss, teach and perform PHAS competencies challenges without the limitations of the random clinical exposure and role modeling by the staff.

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Table 1. Demographic Characteristics

	Male	Female	Total n (%)
PGY 1	2	3	5 (24)
PGY 2	0	1	1 (5)
PGY 3	3	3	6 (29)
PGY 4	3	4	7 (33)
PGY 5	0	1	1(5)
PGY 6	0	1	1(5)
n (%)	8 (38)	13 (62)	21(100)

PGY: post-graduate year of residency.

Table 2 GIOSAT Scores for Two Simulation Scenarios: Do Not Resuscitate and Morphine overdose.

Competency	DNR		MOD		Both scenarios	
	Mean	SD	Mean	SD	Mean	SD
Professional	3.95	1.21	4.55	0.86	4.25	1.09
H. Advocate	3.86	1.24	3.97	0.96	3.9	1.11
Scholar	3.63	1.02	3.29	0.75	3.46	0.91
Total PHAS	3.77	0.73	3.94	0.55	3.85	0.56
Communicator	4.02	1.00	4.32	0.82	4.17	0.92
Collaborator	3.98	0.99	3.77	0.86	3.88	0.94
Manager	3.65	1.10	3.87	0.69	3.76	0.92
Total Intrinsic	3.82	0.70	3.96	0.48	3.89	0.52
Situation Awareness	3.85	0.97	4.02	0.83	3.94	0.90
Medical History	3.65	1.22	3.87	0.78	3.76	1.03
Exam Pt & Equip.	3.05	1.06	3.65	0.95	3.35	1.05
Diag. Diff.	3.32	1.30	3.03	1.04	3.17	1.18
Conf/Inv.	3.96	.92	3.24	0.90	3.59	0.98
Medical Therap.	4.04	0.80	3.92	0.86	3.98	0.83
Proced. Therap.	3.85	1.20	4.24	0.72	4.04	1.00
Deal Chang Sit.	3.74	1.25	3.02	1.18	3.38	1.26
Total ME	3.56	0.72	3.60	0.65	3.58	0.51
Total Scores	3.67	0.65	3.76	0.43	3.71	0.47

All scores are out of a possible maximum of 6. GIOSAT: Generic integrated objective structured assessment tool. DNR: Do not resuscitate. MOD: Morphine overdose. SD: Standard deviation. PHAS: Professional, Health Advocate and Scholar. H. Advocate: Health

Advocate. Exam. Pt & Equip.: Examine patient and equipment. Diag. Diff: Diagnosis and differentials. Conf/Inv.: Confirmation Investigations. Medical Therap: Medical therapy. Proced, Therap.: Procedure therapeutics. Deal Chalg. Sit.: Dealing with changing situations. ME: Medical Expert.

Table 3 Comparison of Both Scenarios

Subscale	DNR		MOD		Paired T Test		Correlation	
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	<i>t</i>	<i>p</i>	<i>R</i>	<i>p</i>
PHAS	3.77	.73	3.94	.55	-1.15	.264	.48	.029
Intrinsic	3.82	.70	3.96	.48	-1.07	.294	.53	.014
Medical Expert	3.57	.72	3.60	.47	-.288	.776	.46	.038
Total	3.67	.65	3.76	.43	-.67	.505	.52	.016

Paired T Test and correlation of mean total scores of anesthesia residents performing two simulation scenarios. DNR: Do not resuscitate scenario. MOD: Morphine overdose scenario. N=21 participants.

Table 4 Generalizability Study for Six Intrinsic and Medical Expert Competencies

Facet	VC	%VC
<i>P</i>	0.139	23
<i>S</i>	0.000	0
<i>R</i>	0.016	3
<i>C</i>	0.015	2
<i>Ps</i>	0.082	14
<i>Pr</i>	0.003	1
<i>Pc</i>	0.002	0
<i>Sr</i>	0.024	4
<i>Sc</i>	0.003	1
<i>Rc</i>	0.016	3
<i>Psr</i>	0.111	19
<i>Psc</i>	0.041	7
<i>Prc</i>	0.035	6
<i>Src</i>	0.003	1
<i>Psrc</i>	0.096	16

G-study for two scenarios (Do not resuscitate and morphine overdose), two competencies (Intrinsic and Medical Expert), four blinded raters, and twenty one anesthesia residents. *p*= participants, *s*= scenarios, *r*= raters, *c*= competency.

Table 5 *Decision Study* for Six Intrinsic and Medical Expert Competencies.

Scenario	Rater	Competency	G
1	1	2	.33
1	2	2	.42
1	5	2	.50
2	1	2	.48
2	2	2	.58
2	5	2	.66
5	1	2	.65
5	2	2	.74
5	5	2	.82
10	1	2	.74
10	2	2	.82
10	5	2	.89

D-Study for two scenarios: Do not resuscitate and morphine overdose, two competencies: Intrinsic and Medical Expert. Participants: Twenty one anesthesia residents. G= Generalizability coefficient.

Table 6 Generalizability Study for the PHAS and Medical Expert Competencies

Facet	VC	%VC
<i>P</i>	0.121	20
<i>S</i>	0.000	0
<i>R</i>	0.016	3
<i>c</i>	0.021	4
<i>ps</i>	0.040	7
<i>pr</i>	0.019	3
<i>pc</i>	0.004	1
<i>sr</i>	0.034	6
<i>sc</i>	0.003	1
<i>rc</i>	0.018	3
<i>psr</i>	0.101	17
<i>psc</i>	0.035	6
<i>prc</i>	0.022	4
<i>src</i>	0.002	0
<i>psrc</i>	0.165	27

G-study for two scenarios: Do not resuscitate and morphine overdose, two competencies: PHAS (Professional, Health Advocate and Scholar) and Medical Expert, four blinded raters. Twenty one anesthesia residents. *p*= participants, *s*= scenarios, *r*= raters, *c*= competency.

Table 7 Decision Study for the PHAS and Medical Expert Competencies.

Scenario	Rater	Competency	G
1	1	2	0.31
1	2	2	0.42
1	5	2	0.54
2	1	2	0.44
2	2	2	0.57
2	5	2	0.69
5	1	2	0.60
5	2	2	0.72
5	5	2	0.82
10	1	2	0.68
10	2	2	0.79
10	5	2	0.87

D-Study for two scenarios: Do not resuscitate and morphine overdose, two competencies: PHAS (Professional, Health Advocate and Scholar) and Medical Expert. Participants: Twenty one anesthesia residents. G= Generalizability coefficient.

Table 8 Correlations between Post-Graduate Years and Scores.

Competency	Variable	Correlation coefficient	p
PHAS	PGY	.60	.004
Six Intrinsic	PGY	.65	.002
Medical Expert	PGY	.26	.250
Total GIOSAT	PGY	.47	.030

Pearson correlation coefficients. Level of training described as post-graduate year of residency (PGY). PHAS: Professional, Health Advocate and Scholar CanMEDS competencies. Intrinsic CanMEDS competencies include PHAS and Communicator, Collaborator and Manager. N= 21 anesthesia residents performed two scenarios scored by four trained blinded raters.

Table 9. Correlations between PHAS and other GIOSAT scores.

GIOSAT Scores	Correlation Coefficients	p
Non-PHAS Intrinsic	.91	.000
Medical Expert	.70	.000
Total excluding PHAS	.82	.003

Pearson's correlation between PHAS scores and the average of Communicator, Collaborator and Manager Intrinsic Scores; averaged Medical Expert Scores and averaged Total Scores excluding PHAS. Data from 21 anesthesia residents performing two simulation scenarios scored by four trained blinded raters.

Table 10. Decision Making to Discontinue Resuscitation in the DNR Scenario

Decision making approach	Number of Participants (%)
Found DNR directives and confirmed identity	10 (47.6)
Never stop CPR did not find DNR directives	5 (23.8)
Found DNR directives, confirmed identity and called the relative to reconfirm information.	3 (14.2)
Found DNR directives and called staff	1 (4.7)
Three cycles of good CPR. Did not find DNR directives	1 (4.7)
Found bracelet and did not confirm with any other information.	1 (4.7)

Table 11 Preparation for the Disclosure in the Morphine Overdose Scenario

Preparation	Number of Participants (%)
Only use the Chart	15 (71.4)
Use the CMPA Guidelines	4 (19)
Call Staff	1 (4.7)
Clarify with the nurse	1 (4.7)

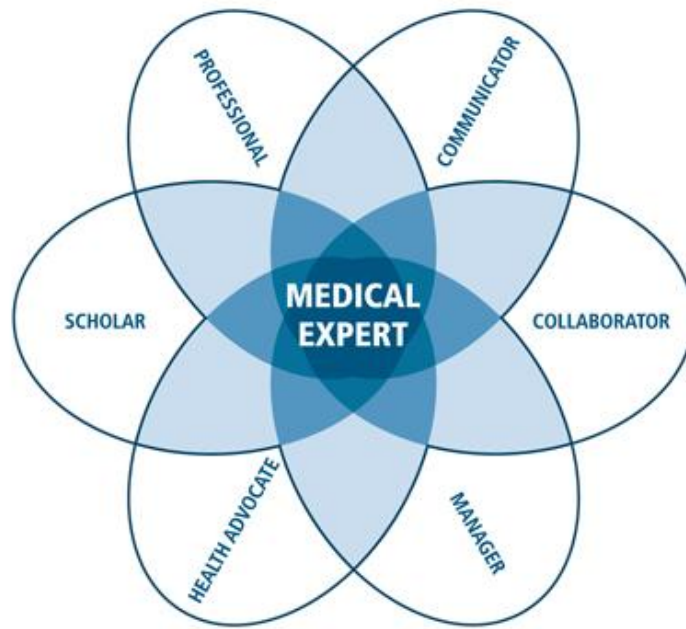


Fig. 1. The Canadian Medical Education Directives for Specialists: CanMEDS.

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<http://rcpsc.medical.org/canmeds>. Reproduced with permission

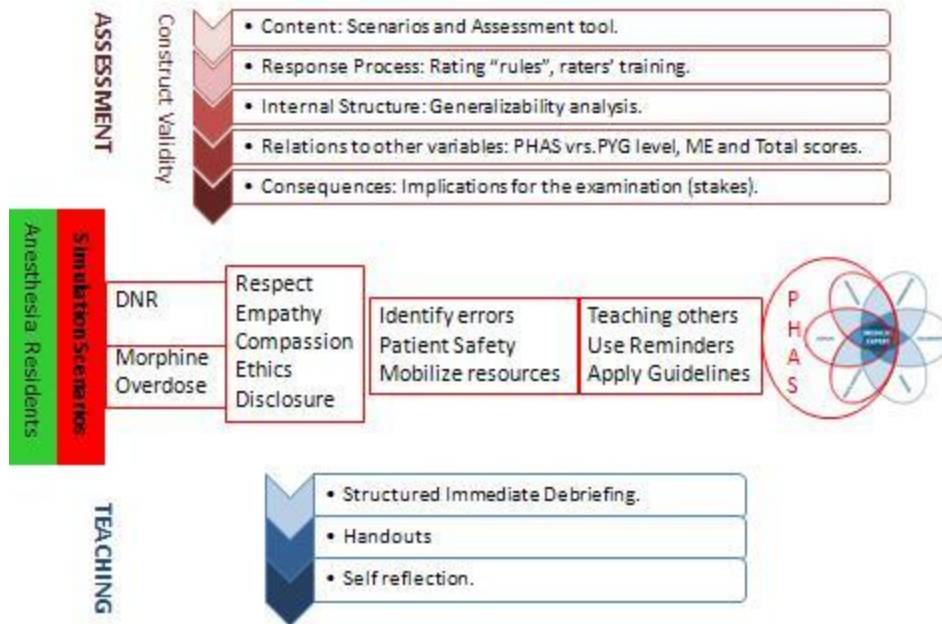


Fig 2. PHAS Study Framework.

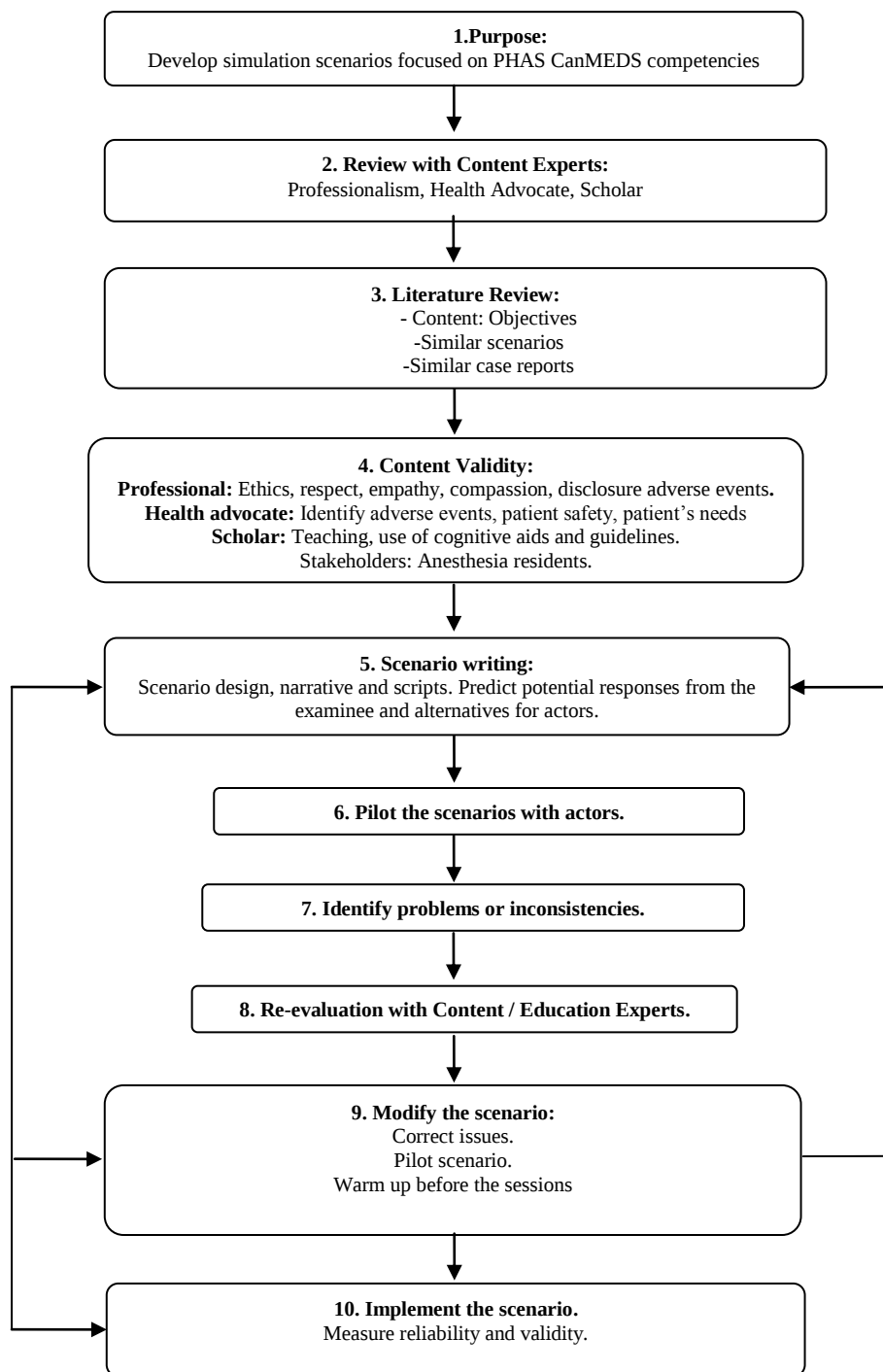


Fig. 3. Scenario design process. (Modified with permission from: Hamstra SJ, 2012)

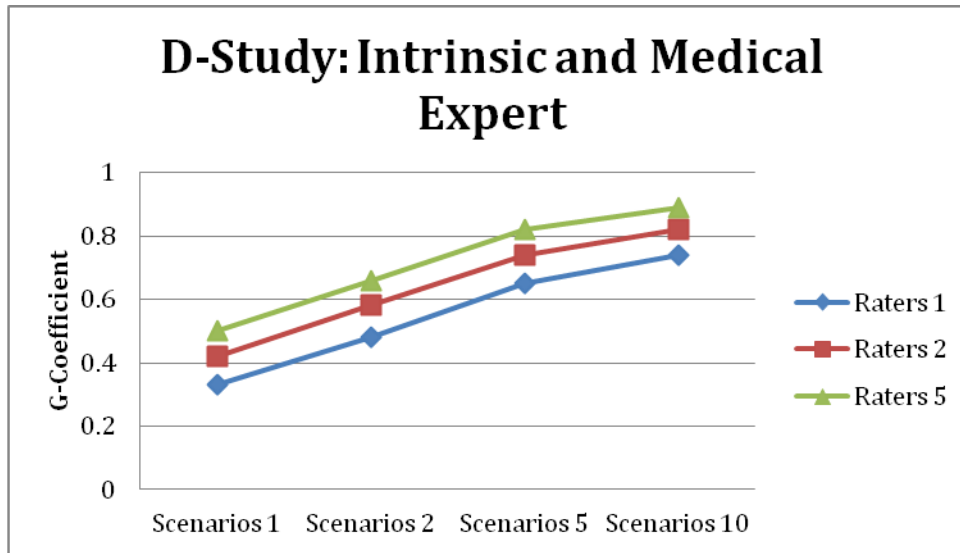


Fig 4. Decision study for Intrinsic and Medical Expert. G-Coefficient for various numbers of raters and scenarios.

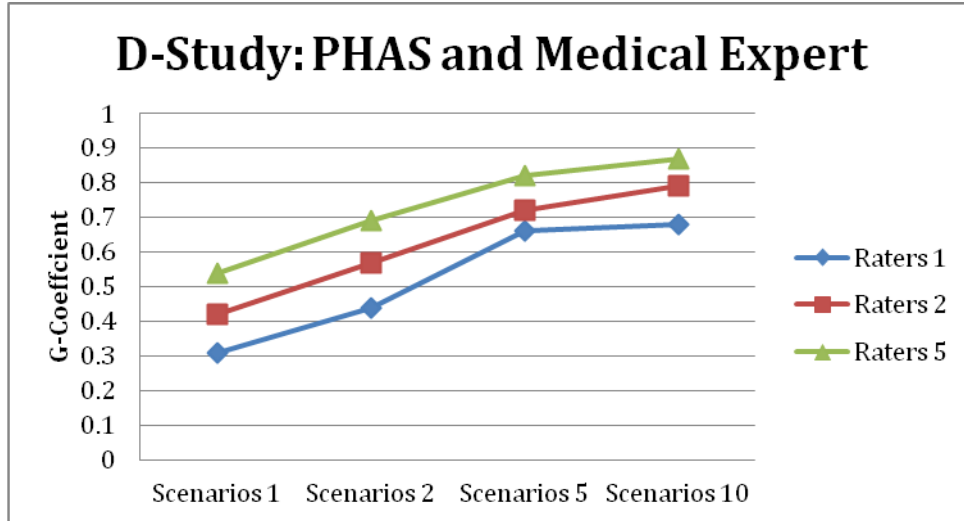


Fig 5. Decision study for PHAS and Medical Expert. G-Coefficient for various numbers of raters and scenarios.

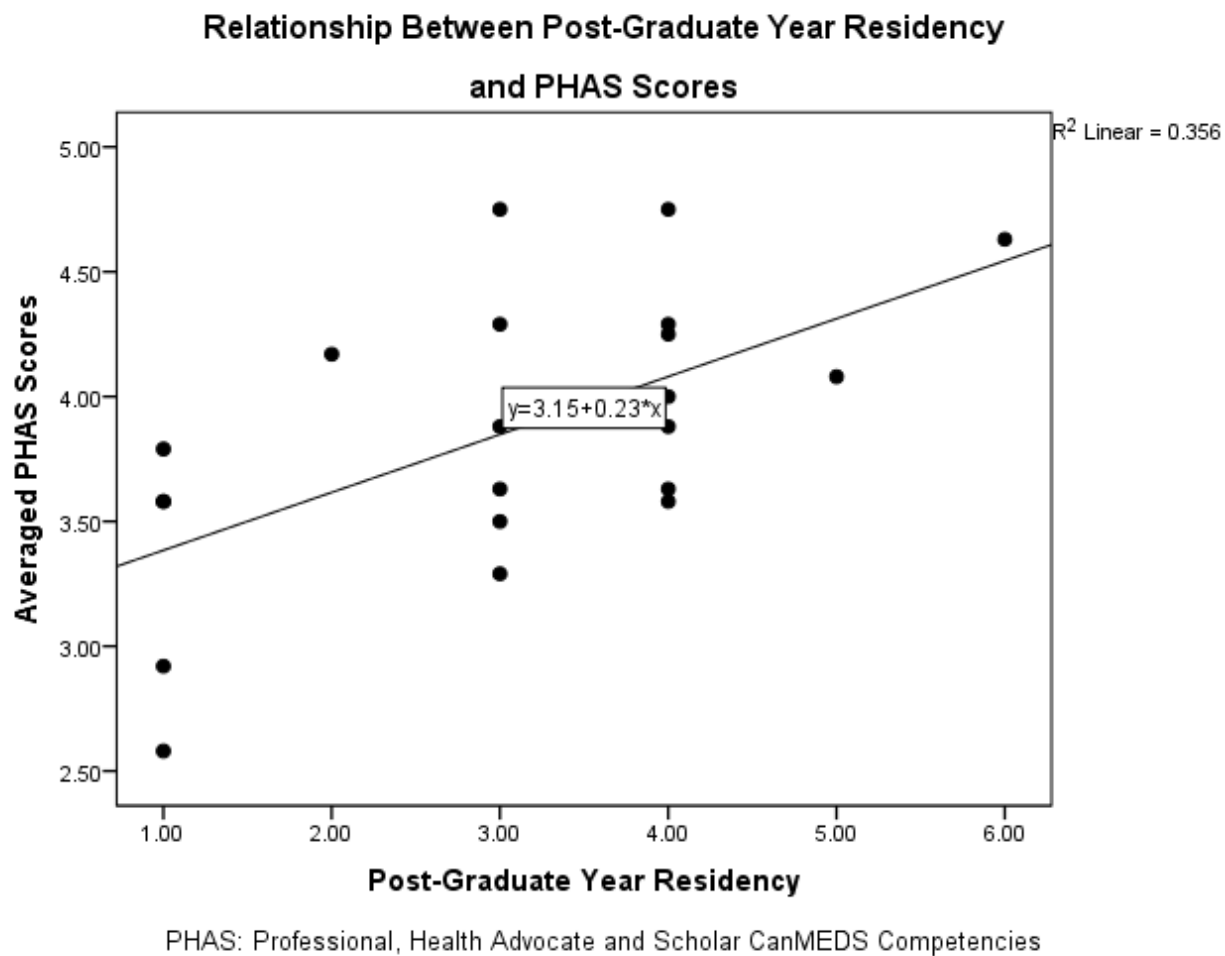


Fig 6. Correlation between PGY (post-graduate year of residency) and averaged total PHAS scores (Professional, Health Advocate and Scholar). Data from 21 anesthesia residents performing two simulation scenarios scored by four trained blinded raters. $R = .59$. $p = .004$.

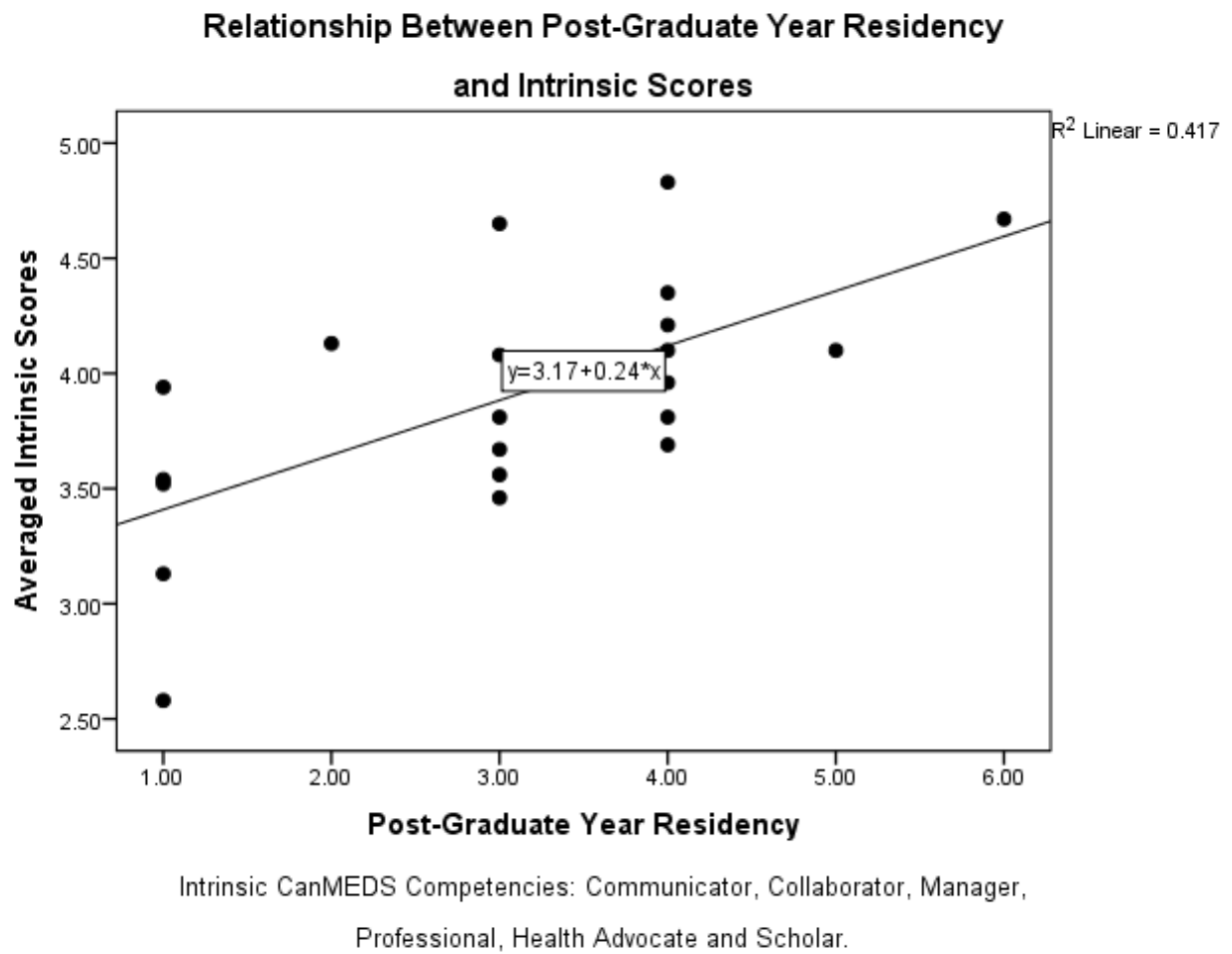


Fig 7. Correlation between PGY (post-graduate year of residency) and mean total Intrinsic scores. Data from 21 anesthesia residents performing two simulation scenarios scored by four trained blinded raters. $R = .65$. $p = .0002$.

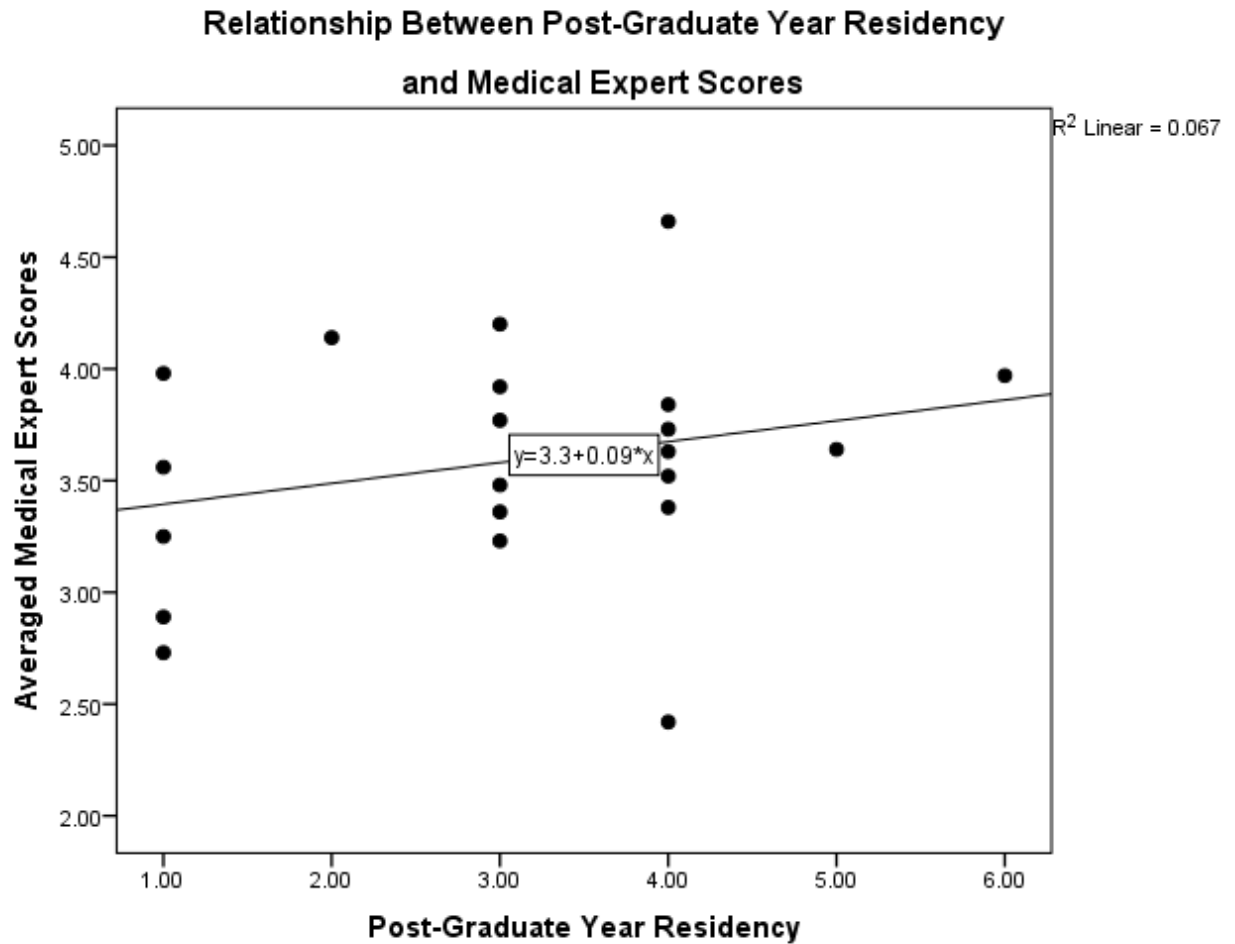


Fig 8. Correlation between PGY (post-graduate year of residency) and mean Medical Expert scores. Data from 21 anesthesia residents performing two simulation scenarios scored by four trained blinded raters. $R = .26$. $p = .25$.

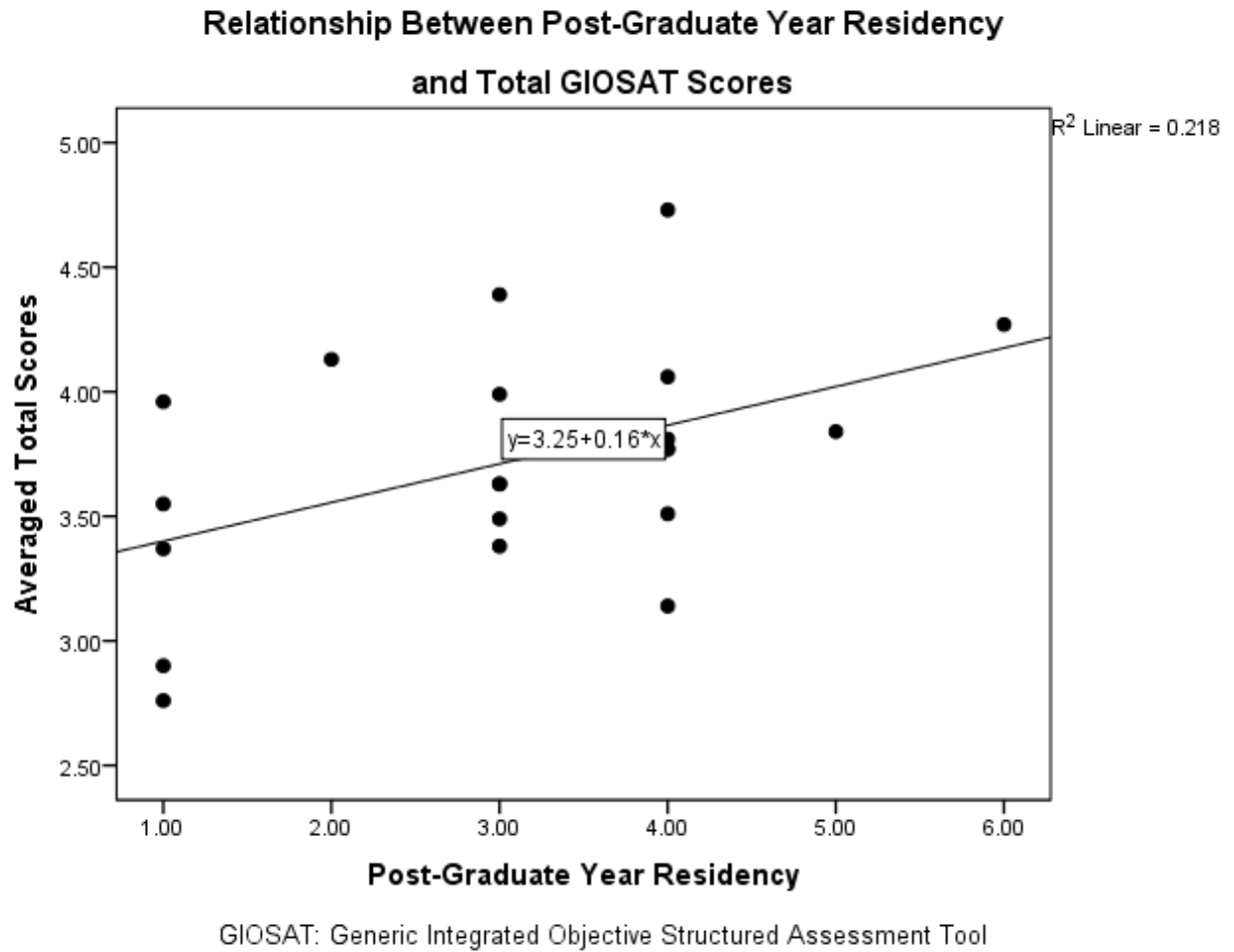


Fig 9. Correlation between PGY (post-graduate year of residency) and Averaged Total GIOSAT scores. Data from 21 anesthesia residents performing two simulation scenarios scored by four trained blinded raters. $R = .47$. $p = .03$.

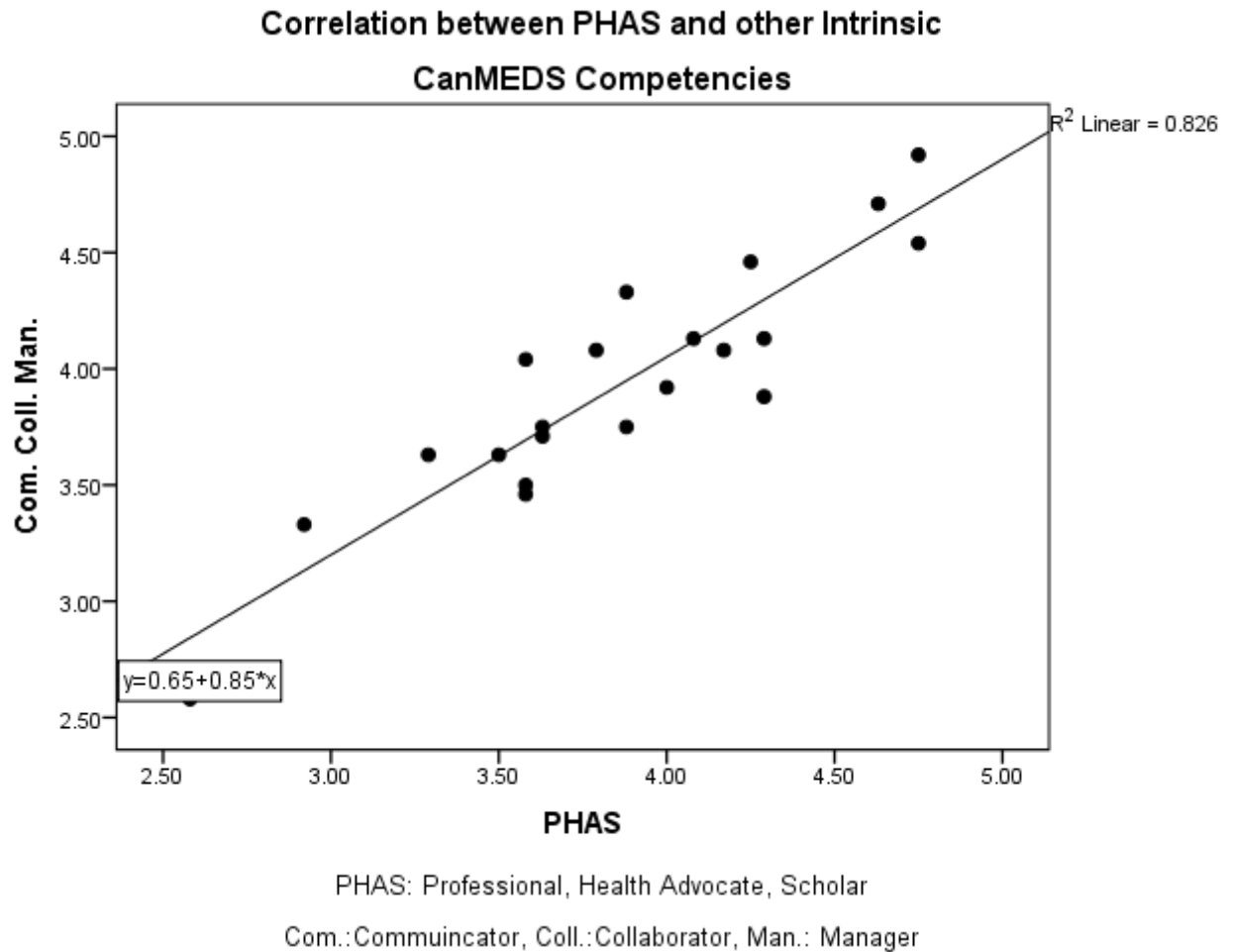


Fig 10. Correlation between PHAS (Professional, Health Advocate and Scholar) scores and other Intrinsic Scores: Communicator, Collaborator and Manager. Data from 21 anesthesia residents performing two simulation scenarios scored by four trained blinded raters. $R=0.91$, $p=.000$

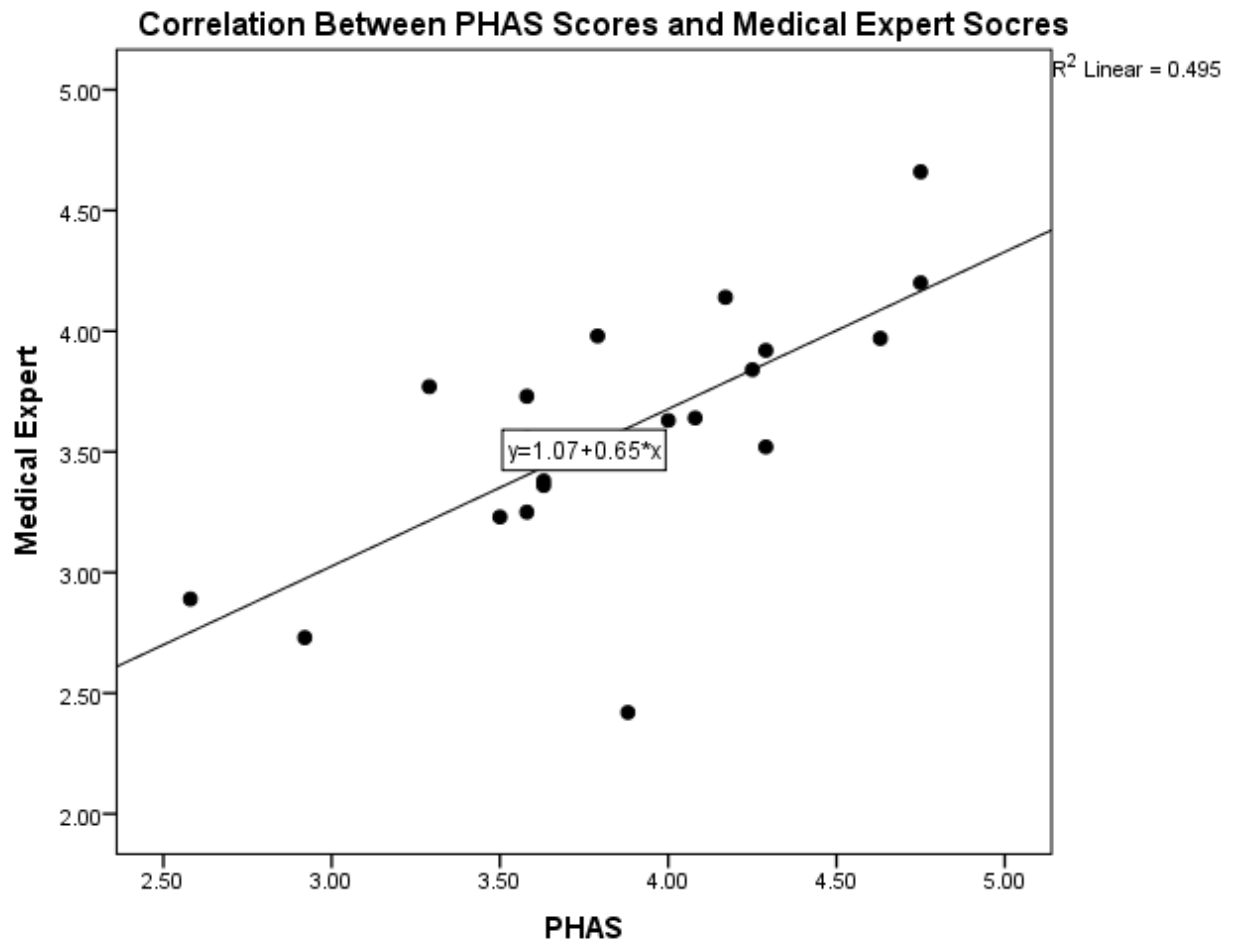


Fig 11. Correlation between PHAS (Professional, Health Advocate and Scholar) scores and Medical Expert Scores. Data from 21 anesthesia residents performing two simulation scenarios scored by four trained blinded raters. $R=0.70$, $p=.000$

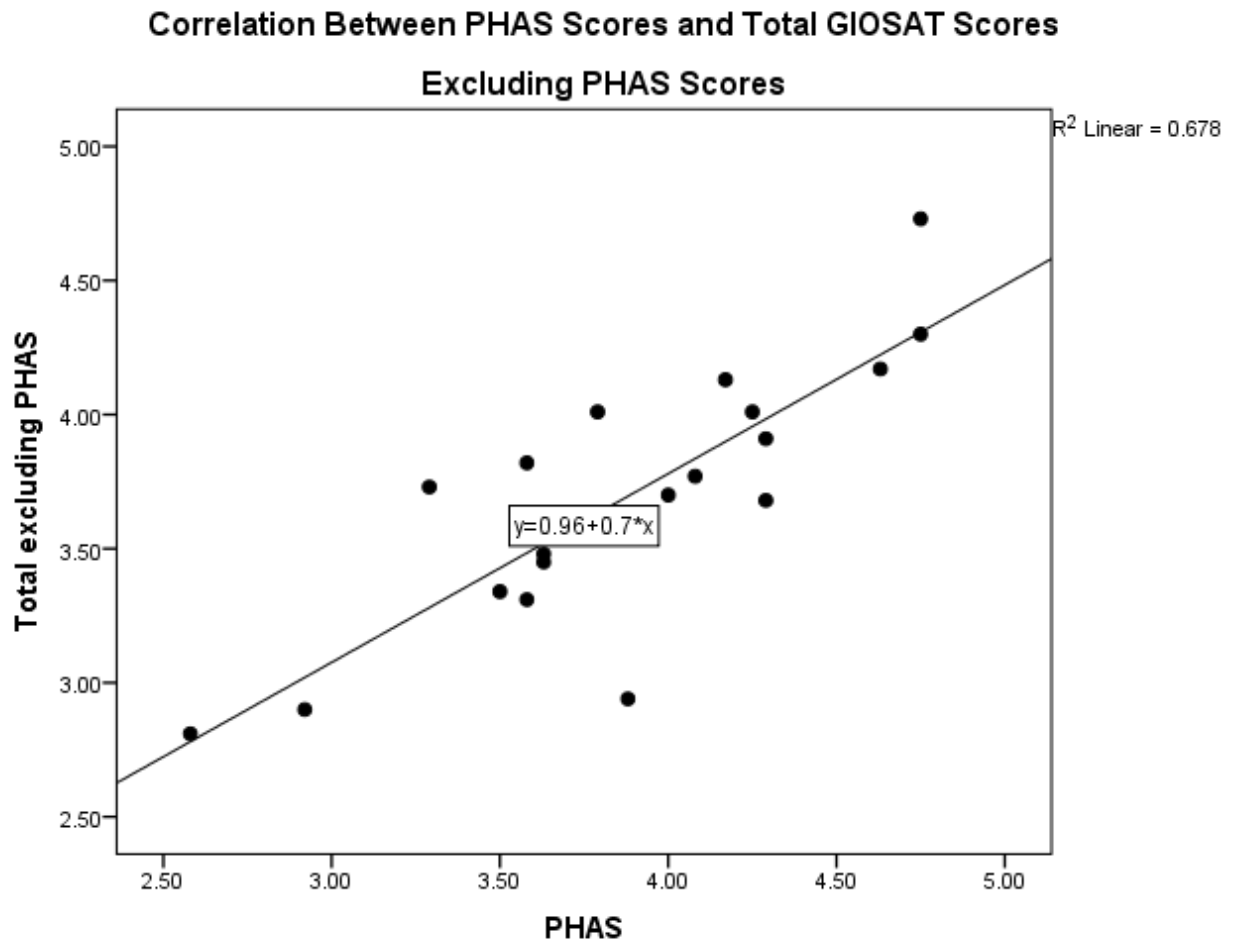


Fig 12. Correlation between PHAS (Professional, Health Advocate and Scholar) scores and Total GIOSAT Scores excluding PHAS scores. Data from 21 anesthesia residents performing two simulation scenarios scored by four trained blinded raters. $R=0.82$ $p=.000$

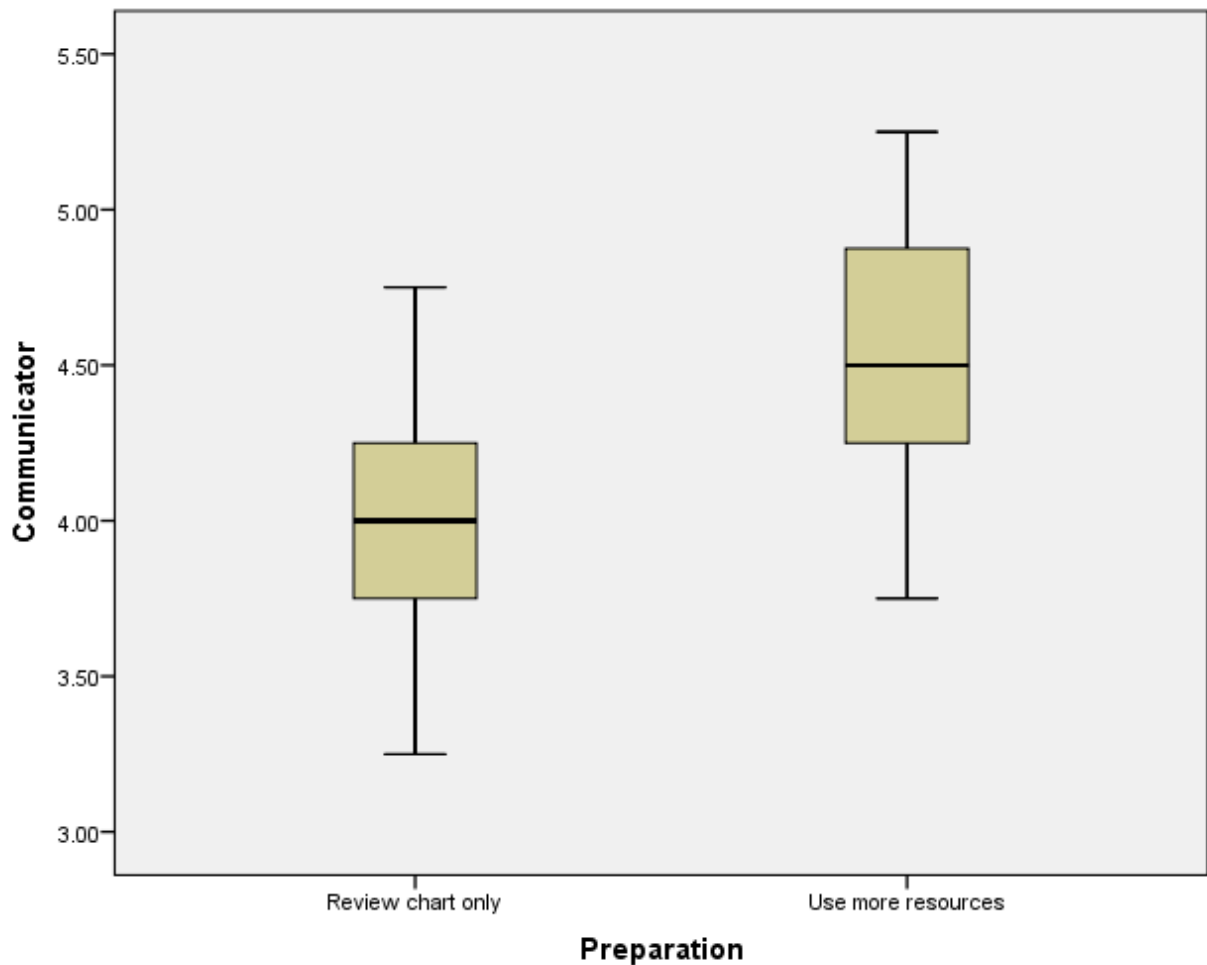


Fig 13. Comparison in the Communication scores in the MOD scenario. Participants used the chart only vs. the chart and other resources including the disclosure guidelines, nurse information or phone call. Significant differences were found. $t=-2.54$ ($df=19$) $p=.02$. For each box, the dark horizontal line represents the median. The bottom and top of the box represent 25th and 75th percentile. The whiskers represent the range.

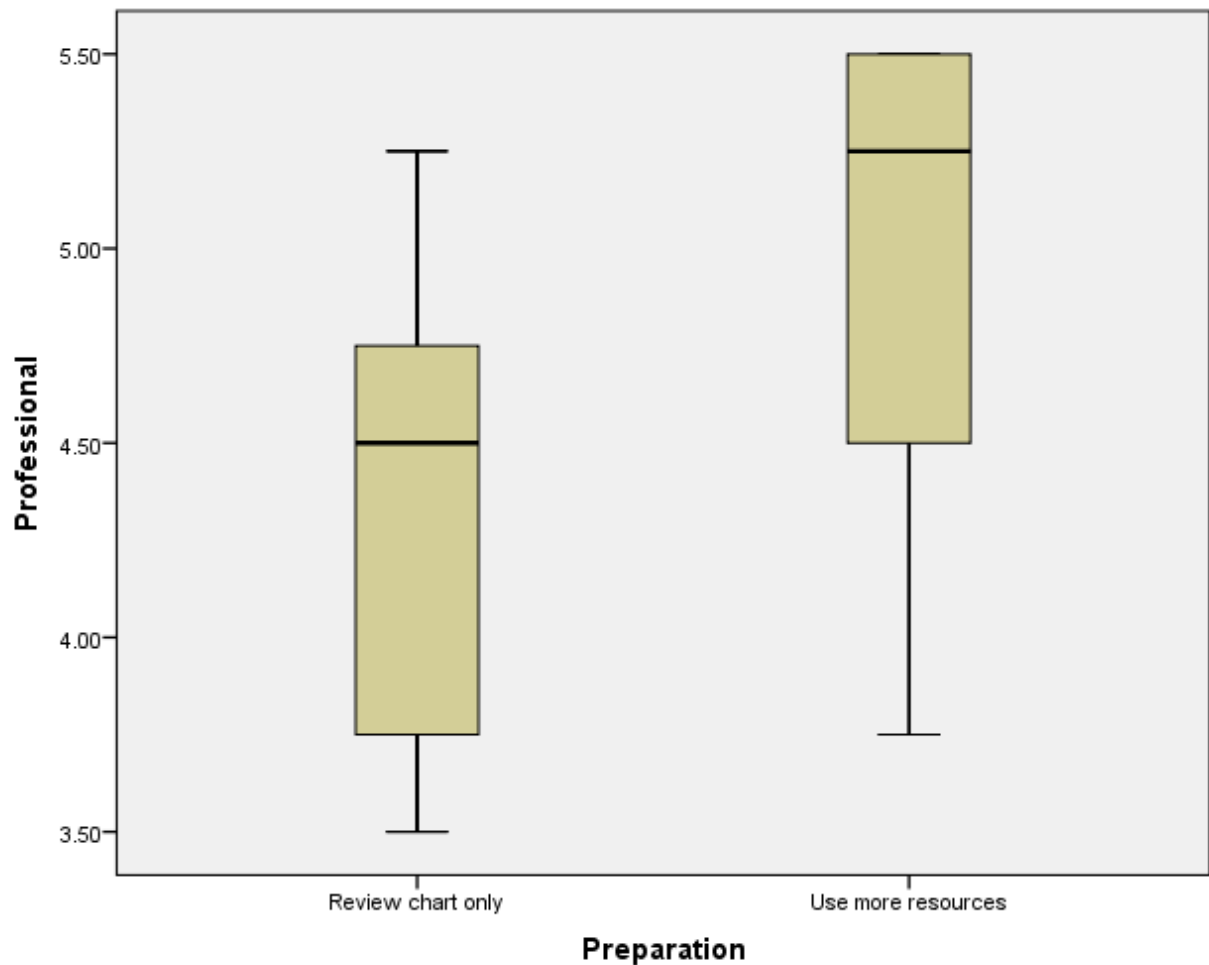


Fig 14. Comparison in the Professional scores in the MOD scenario. Participants used the chart only vs. the chart and other resources including the disclosure guidelines, nurse information or phone call. No significant differences were found: $t=-1.8$ $df(19)$ $p=0.08$. For each box, the dark horizontal line represents the median. The bottom and top of the box represent 25th and 75th percentile. The whiskers represent the range.

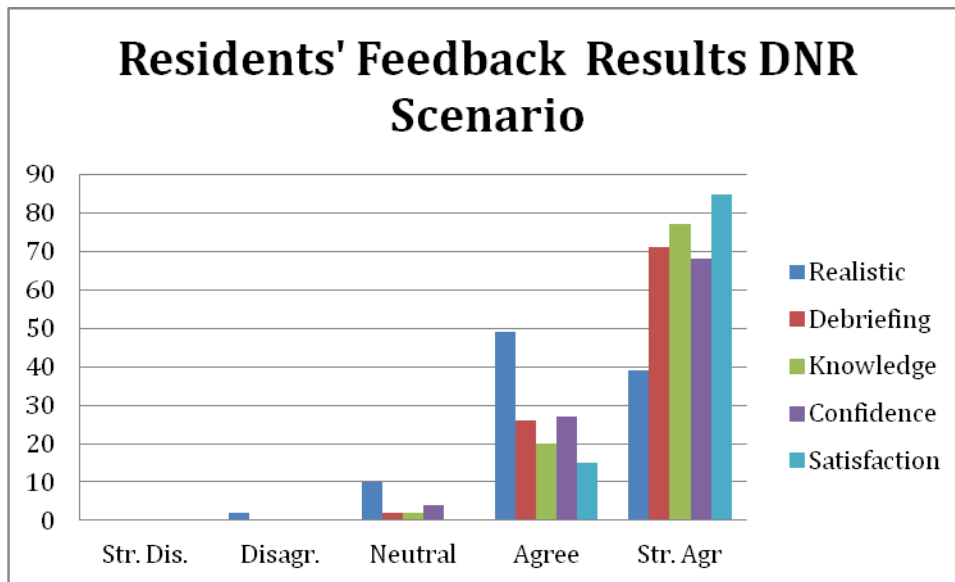


Fig. 15 Residents' feedback form results from 21 residents performing DNR scenario. DNR: Do not resuscitate. Results are shown in percentages.

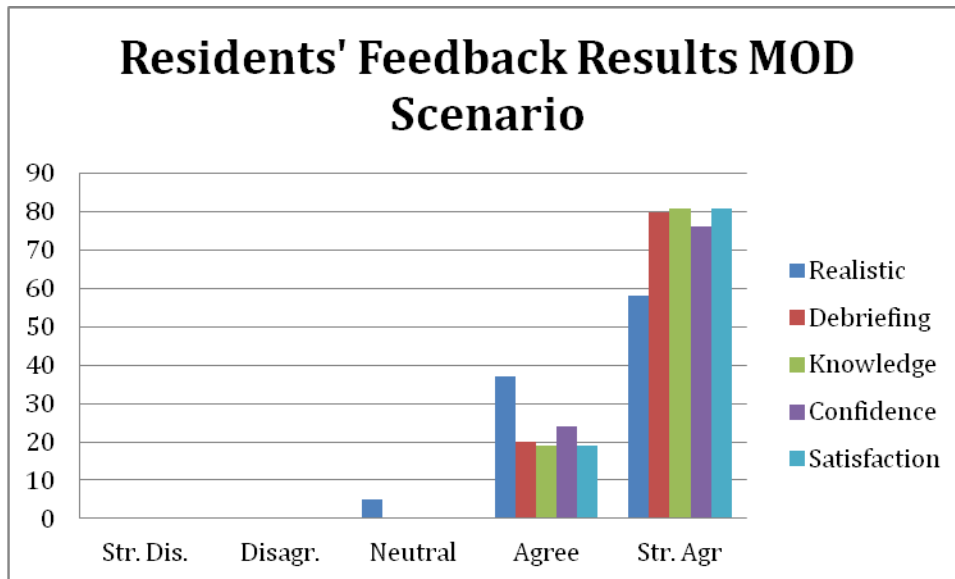


Fig. 16 Residents' feedback form results from 21 residents performing MOD scenario. MOD: Morphine overdose. Results are shown in percentages.

Appendix 1. GIOSAT

Date: _____ Hour: _____ PGY: 1 2 3 4 5 Staff

Scenario: _____ Specialty: Anesthesia EM Other: _____ Rater N.: _____

Rating	1	2	3	4	5	6
Descriptor	Very poor	Poor	Marginal	Acceptable	Good	Very Good
Performance	Clearly Endangered Patient safety.	Clearly unacceptable performance.	Indicated cause of concern.	Satisfactory but significant improvements required to reach mastery level.	Satisfactory but minor improvements required to reach mastery level.	Consistently high standard. Enhancing patient safety. Example for others

Intrinsic CanMEDS Competencies

- 1. Communicator:** 1 2 3 4 5 6 N/A
 Clear / Concise, verbal and non-verbal, closed loop technique, share information “think aloud”, orient new members , exchange information, listen team input.
- 2. Collaborator:** 1 2 3 4 5 6 N/A
 Should stay calm and in control during crisis, demonstrate authority and leadership or responds appropriately to leadership. Clear understanding of his/her roles within the team. Support each other.
- 3. Manager** 1 2 3 4 5 6 N/A
 Formulate a plan in advance; establish priorities with appropriate utilization of key resources. Ask for help appropriately.
- 4. Professional:** 1 2 3 4 5 6 N/A
 Maintain standards of care, mutual respect, ethics and legal codes. Team members refer to established protocols. Disagreements or conflicts among team members are addressed
- 5. Health Advocate:** 1 2 3 4 5 6 N/A
 Attention to patient’s/team safety risks and needs.
- 6. Scholar** 1 2 3 4 5 6 N/A
 Teaching and demonstrating reflective learning. Application and translation of medical knowledge beyond algorithms, e.g. critically evaluate information and its sources, and apply this appropriately to practice decisions.

Date:_____ Hour:_____ Trainee Level: 1 2 3 4 5 Staff

Scenario:_____ Specialty: Anesthesia EM Other:

Rating	1	2	3	4	5	6
Descriptor	Very poor	Poor	Marginal	Acceptable	Good	Very Good
Performance	Endangered Patient safety clearly.	Clearly unacceptable performance.	Indicated cause of concern.	Satisfactory but could improve.	Satisfactory but minor improvements required to reach mastery level.	Consistently high standard. Enhance patient safety. Example for others

Medical Expert CanMEDS Competencies

1. **Situation Awareness** 1 2 3 4 5 6 **N/A**
Attention / Vigilance. Frequent scan of environment (monitors). Anticipates likely events.
2. **Medical History** 1 2 3 4 5 6 **N/A**
Gathering information, medical history.
3. **Examine Patient / Equipment** 1 2 3 4 5 6 **N/A**
Quick problem directed physical exam. Quick check of equipment / monitors.
4. **Diagnosis / Differentials** 1 2 3 4 5 6 **N/A**
Recognize the problem and communicates. Consider differentials.
5. **Confirmation / Investigations** 1 2 3 4 5 6 **N/A**
Orders and interprets appropriately pertinent Labs / Images / Monitors.
6. **Medical Therapeutic** 1 2 3 4 5 6 **N/A**
Compensatory and specific agent or medication, time, dose, route and response. May use checklists and reminders.
7. **Procedure Therapeutic** 1 2 3 4 5 6 **N/A**
Compensatory and specific procedure / intervention, time, technique and response. May use checklists and reminders.
8. **Deal with changing situations** 1 2 3 4 5 6 **N/A**
Reassess / re-evaluate. Recognize changes.

APPENDIX 2 REB APPROVAL & AMENDMENT



Ottawa Hospital Research Ethics Boards / Conseils d'éthique en recherches

726 Parkdale Avenue, Box 411, Ottawa, Ontario K1Y 4E9 613-798-6565 ext. 14902 Fax: 613-761-4311
<http://www.ohri.ca/ohreb>

August 16, 2012

Dear Dr. . . .

**Re: Protocol # 20120439-01H Assessment of the "Challenging" CanMEDS Competencies:
Professional, Health Advocate and Scholar During Crisis Simulation.
"PHAS Simulation Psychometric Study"**

Protocol approval valid until - October 16, 2012

Thank you for the letter of August 16, 2012. I am pleased to inform you that this protocol underwent delegated review by the Ottawa Hospital Research Ethics Board (OHREB) and is approved for two months to begin recruiting English speaking participants. No changes, amendments or addenda may be made to the protocol or the consent form without the OHREB's review and approval.

Approval is for the following:

- Protocol, version 1, dated June 05, 2012
- English-only GIOSAT, version 2, dated July 27, 2012
- English Confidentiality Agreement, version 2, dated July 27, 2012
- English Feedback Form, version 1, dated July 27, 2012
- English and French Email Invitation/Poster, version 2, dated July 27, 2012
- English Information Sheet and Consent Form, version 1, dated July 30, 2012

The validation date should be indicated on the bottom of all consent forms and information sheets (see copy attached).

Upon receipt of the French Information Sheet and Consent Form, Confidentiality Agreement and Feedback Form, ethical approval will be extended to August 15, 2013 and the recruitment of French speaking participants may begin. When submitting the French documentation confirm that it has been translated or approved by Eric Lepine (email all documentation to him at elepine@ohri.ca).

The Ottawa Hospital Research Ethics Board is constituted in accordance with, and operates in compliance with the requirements of the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans; Health Canada Good Clinical Practice: Consolidated Guideline; Part C Division 5 of the Food and Drug Regulations of Health Canada; and the provisions of the Ontario Health Information Protection Act 2004 and its applicable Regulations.

Yours sincerely, . . .

Ottawa Hospital Research Ethics Board

/hm

Subject: Protocol #20120439: French Exemption and Amendment dated, August 23, 2012

Protocol #20120439: Assessment of the "Challenging" CanMEDS Competencies: Professional, Health Advocate and Scholar During Crisis Simulation. "PHAS Simulation Psychometric Study"

Hello,

Thank you for the letter of August 23, 2012 requesting an exemption from the French requirement. The chairman has reviewed and approved the request. I will be processing the approval letter to extend the expiry date to August 15, 2013 this afternoon or tomorrow morning.

The Amendment Report, dated August 23, 2012 has been reviewed. There is no objection to the enrolment of trainees in programmes other than ours who participate in research here and on their own behalf; however we cannot decide on behalf of other institutions. Please clarify whether you plan to go to these institutions to recruit participants or whether the trainees from the other institutions are physically here at The Ottawa Hospital completing a portion of their residency. Regardless, administrative or REB approval from the other institutions would be required before recruitment could begin.

With regard to the PGY6 Fellows, are they from U of O Faculty of Medicine or are you referring to those from other institutions?

Please revise the 'recruitment' section of the OHREB application, being specific about how you plan to recruit the trainees from the institutions

Upon receipt of the information requested above, approve of the amendment may be granted.

Ottawa Hospital Research Ethics Boards
Ottawa Hospital, Civic Campus
725 Parkdale Ave, Civic Box 411
Loeb Building
Ottawa, Ontario
K1Y 4E9
Ph: 613-798-5555 ext. 14146

For General Inquiries, please email:
rebadministration@ohri.ca

APPENDIX 3 Informed Consent

INFORMATION SHEET/CONSENT FORM

Assessment of the “Challenging” Can MEDS competencies: Professional, Health Advocate, and Scholar during crisis simulation.”PHAS” simulation psychometric study”

“PHAS Simulation Study”

Principal Investigator: Dr Victor Neira. Department of Anesthesia. CHEO 613-737-2431

You are being asked as a resident in anesthesiology to participate in a research study conducted by Dr. Victor Neira.

Please read this Information Sheet and Consent Form carefully and ask questions as you like before deciding whether to participate in this research study. Once you understand the study, you will be asked to sign this form if you wish to participate. Please take your time to make your decision.

The Purpose of the Study

The purpose of this study is to validate the GIOSAT (generic integrated objective assessment tool) assessing anesthesia resident’s performance video-records during critical simulated scenarios focused on Professional Health Advocate and Scholar CanMED roles.

Study Procedures and Description

You will participate in a structured simulation-based video recorded clinical scenario. The sessions begin with you accepting the use of actors and a mannequin from the instructor. During the course of the session it is possible that a critical event will occur. You will have all the necessary tools to manage, anticipate, assess and react to any event. We are attempting to create scenarios as realistic as possible for the clinical condition of interest. During the scenario, you could find health care professionals or family members (actors) that will respond as per your request. The investigators have scripted the actors and may control their responses from the control room using a wireless communication device according to the scenario content to favour consistency of information provided. The mannequin has sounds and voice, and is also controlled by the investigators from the control room. As this is simulation, information may be given to you (from the actors) that is unavailable from the simulated patient or mannequin. You can ask for any information you may need. After each scenario the resident will have a debriefing session for reflective learning. This debriefing session will also be recorded for further evaluation. An anonymous feedback form will be offered at the end of each scenario for quality assurance.

Study Duration.

This study will be conducted on a few scheduled days at the uOSSC University of Ottawa Skills and Simulation Centre. Your time commitment will be approximately 3 hours which includes 2 different scenarios, immediate debriefing sessions, breaks, and reasonable travel time.

Possible Risks and Discomforts

As this is a simulated event, there is no actual risk to the participant. However, since we encourage the participants to treat the simulated scenario as a real case in a critical situation, stress and emotional responses may occur. There may be some discomfort knowing that the sessions are video-recorded, but this will be minor and it will pass.

Possible Benefits

You may not receive any direct benefit from your participating in the study. You may benefit from the learning experience of these scenarios and debriefing in your professional development.

Your participation in this study may help us in developing a tool and scenarios to evaluate resident performance and learning in critical situations.

Compensation

You will not receive any economical compensation for participating in this study.

Confidentiality

This is an academic exercise. Therefore none of the information collected will be passed on to your program director. Your performance within the simulation scenario will NOT be part of your residency performance evaluation.

At the time of enrolment into the study you will be assigned an independent study number which will be used on all data collection forms including the performance rating forms (GIOSAT) and the feedback form. The link between your name and the independent study number will only be accessible by Dr. Neira and his staff. The master list, linking this study number and your name will be kept separately from the study data and stored separately and securely in a locked office filing cabinet.

All personal information will be kept confidential, unless release is required by law. Representatives of the Ottawa Hospital Research Ethics Board as well as The Ottawa Hospital Research Institute may review your files under the supervision of Dr. Neira's staff for audit purposes. You will not be identifiable in any publications or presentations resulting from the study such as your name, university, residency program, unless you provide consent to allow this information to appear.

Electronic records will be stored on a password protected hospital server at CHEO or TOH. All videos will be download, encrypted and sent offsite for evaluation by raters.

The video files will be encrypted at the uOSSC using TrueCrypt software and stored in a secure location. The video data will only be seen by the investigators and by raters. When videos are reviewed by the raters at the conclusion of the study your identity can not be anonymized, as this would be incompatible with the evaluation of the performance on the video recordings.

All the records will be stored until 10 years after termination of the study. At the end of the retention period all paper records will be disposed of in confidential waste or shredded and all electronic and video records will be deleted.

Voluntary Participation

Your participation in this study is voluntary. If you choose not to participate, your decision will not affect your training or evaluation at the University of Ottawa or your current or future relationship with The Ottawa Hospital. Furthermore you have the right to withdraw from the study at any time without impact to your training. If you decide to withdraw we will ask you for your permission to use the data gathered up to that point.

Questions about the Study

If you have any questions about this study or if you feel that you have any further concerns about your participation, please contact Dr. Victor Neira at CHEO 613-737-2431 or Mary Lou Crossan Research Co-ordinator at 613-798-5555 ext 13790.

The Ottawa Hospital Research Ethics Board has reviewed this protocol. The OHREB considers the ethical aspects of all research studies involving human participants at The Ottawa Hospital. If you have any questions about your rights as a research participant you may contact the Chairperson of the Ottawa Hospital Research Ethics Board at 613-798-5555, extension 14902.

Consent Form

PHAS Simulation Study

Consent to Participate in Research

I understand that I am being asked to participate in a research study about **CanMEDS competencies**. This study has been explained to me by_____.

I have read the 4 page Information and Consent Form. All my questions have been answered to my satisfaction. If I decide at a later stage in the study that I would like to withdraw my consent, I may do so at anytime.

I voluntarily agree to participate in this study.

A copy of the signed Information Sheet and/or Consent form will be provided to me.

Signatures

Participant's Name (Please Print)

Participant's Signature

Date

Investigator Statement (or Person Explaining the Study)

I have carefully explained to the research participant the nature of the above research study. To the best of my knowledge, the research participant signing this consent form understands the nature, demand, risks and benefits involved in participating in this study.

I acknowledge my responsibility for the well being of the above research participant, to respect the rights and wishes of the research participant and to conduct the study according to applicable Good Clinical Practice guidelines and regulations.

Name of Investigator/Delegate (Please Print)

Date

Signature of Investigator/Delegate

Date

Valid to: October 16,2012

APPENDIX 4

CONFIDENTIALITY AGREEMENT

Date: _____

You are asked to participate in a Clinical Simulation. This exercise is for teaching and learning purposes. The content of the scenario may be used in future sessions with different students.

We encourage you to act as in a real situation, and to avoid comments regarding the scenario content outside the debriefing session.

With your signature below you agree to preserve the content confidential.

Name: _____ Signature: _____

Name: _____ Signature: _____

Name: _____ Signature: _____

Name: _____ Signature: _____

Name: _____ Signature: _____

Appendix 5

PHAS Study Resident Feedback Form

Participant I.D.: _____ **Date:** _____ **Scenario** _____

Grading:

1- Strongly disagree 2- Partially disagree 3- Neutral 4- Partially agree 5-Strongly agree

EVALUATION OF THE SIMULATOR EXPERIENCE	1	2	3	4	5
1. I found it easy to treat the mannequin as a simulated human					
2. The scenario prompted realistic responses from me like I was treating a real patient					
3. The scenario was realistic and pertinent to my practice					
4. This scenario was appropriate for my level of training					
5. The team members were realistic and believable in the simulator environment.					
6. The debriefing session were logically organised and clarified important issues of the scenario					
7. The debriefing session enhanced my fund of knowledge					
8. I expect that the knowledge gained from the scenarios will be helpful to me in practice					
9. I expect that the knowledge gained from crisis management will be helpful in practice					
10. The simulation helped increase my confidence in treating this type of medical problems.					
11. The simulation helped me increase my confidence in treating patients when a crisis occurs.					
12. The staff debriefing me has a good knowledge base.					
13. The feedback I received in the debriefing session was useful and was provided in an appropriate fashion.					
14. The simulator is a valuable teaching tool for residents in general					
15. I would personally like to come back for other sessions					

PHAS Study Resident Feedback Form

Participant I.D.:_____ **Date:**_____ **Scenario:**_____

To what frequency should these sessions be held? Please circle: Every 6 months
Every 12 months Every 24 months Once during the residency program Never
Other:_____

Do you find the video is a valuable teaching tool? Explain Yes ☐ No ☐

1. What do you feel was the most important lesson you learned during the course, and why?

What was most useful?

What would you add to the session?

What would you delete from the session?

Suggestions for future scenarios:

Other comments

APPENDIX 6

Case 1 Asystole with DO NOT RESUSCITATION ADVANCED DIRECTIVES and Poor CPR technique.

Background:

Resuscitation is the ability to reverse premature death, however it can prolong suffering in terminal patients and increase health care cost. (Santonocito, Ristagno, Gullo, & Weil, 2013) Cardiopulmonary resuscitation (CPR) is the default option for patient in the US. Patients and health care providers have an increase interest in allowing terminal patients to die peacefully without inappropriate resuscitation attempts. Despite this interest there are problems in documentation, and patients' involvement in the do not resuscitation (DNR) decision making process. (Castle, Owen, Kenward, & Ineson, 2003)

Ethics about resuscitation is very complex and varies across settings, providers, and countries, and whether to start or how to terminate CPR. The main objective of the DNR and advanced directives (AD) is to avoid futile resuscitations.(Field et al., 2010a) Nursing literature states that students are not often involved in the care of patients who are dying during their clinical rotations. (Leighton & Dubas, 2009) We can infer that similar issues happen in medical education. Even more, there is evidence that physicians residents feel unprepared to lead resuscitation efforts. Many programs fail to adequately prepare physicians personally and professionally to care for patients who are dying and for their families. We developed a simulation scenario focused on the advanced directives and the decision making to terminate resuscitation efforts.

Objectives:

Professional:

1. Ethics: Ask for advanced directives. Respond properly to the DNR directives: discontinue resuscitation, pronounce death of the patient.(Morrison et al., 2010)
2. Recognize and respond to advanced directives: DNR wrist band and card.
3. Code of behavior: Demonstrate respect, commitment, empathy and compassion to the patient, relative, and health care professionals.

Health Advocate:

1. Identify Medical/Procedure error: Sub-optimal resuscitation technique and correct it. Identify patient's risk and special needs (DNR directives).

Scholar:

1. Recognize and correct sub-optimal resuscitation of an asystolic patient with junior staff (or students) in ER.
2. Follow current guidelines for resuscitation.
3. Use of reminders effectively.
4. Demonstrate ability to teach students and junior staff.

Medical Expert:

Recognize a patient in cardiac arrest and lead the basic and advanced cardiac life support. (Berg et al., 2010)(Neumar et al., 2010b)(Field et al., 2010a)

Management of asystole. Perform 2 cycles of good quality CPR according to the current guidelines. (Field et al., 2010b)

1. Investigate 5 Hs and 5 Ts for causes of cardiac arrest. Consider differentials.
2. Gather information from all sources to orient diagnosis and management: health care team, physical exam (DNR bracelet), patient's belongings (Purse contain medications, prescriptions and DNR form).

Case Description:

You receive a code blue (cardiac arrest) call to ER, when you arrive there is a 68 year old female who fainted at the nearby coffee shop, paramedics were called and transferred the patient to your community hospital. When paramedics arrived to the scene and applied the automatic external defibrillator (AED) they found non-shockable rhythm, they started CPR and moved to the hospital quickly. A junior family doctor is managing the case. The patient is not intubated and the respiratory therapist is not giving respiratory support. The physician is doing chest compressions which are too slow and too soft. The nurse is at the bedside with the crash cart and the defibrillator which shows asystole. Unsuccessful resuscitation occurs despite correcting the CPR technique. The patient has a wrist band and a card with the do not attempt resuscitation (DNR) directives because of metastatic breast cancer. The patient is

unresponsive to resuscitation. If the examinee doesn't find or ask for advanced directives the case will continue until 10 min when the scenario is over will be declared.

Expected optimal performance from the senior resident:

- 1) Take control of the situation. Ask for information about the case.
- 2) Correct resuscitation technique compressions at 100/min, depressing the sternum at least 2 inches (5 cm) and allowing complete recoil by lifting the heel of the hand slightly but completely. Perform chest compressions to ventilation ratio 30:2 in the non intubated patient. Once the patient is intubated 8 - 10/ breaths per min. Teach the RT and the team while doing the resuscitation.(Berg et al., 2010)
- 3) Continue resuscitation and follow guidelines. It is appropriate to use reminders. ACLS book and resuscitation cards are available at the bedside.
- 4) Correct Reversible causes: It is expected to request ABGs, E-Lytes, glucose. Lab results: borderline metabolic and respiratory acidosis, normal oxygenation, normal glucose, mild elevation of K. Other exams are also "normal". To avoid deviation from the case objectives, no specific corrections based on the lab results are required.
- 5) Investigate for 5 Hs' (Hypoxia, hypovolemia, hydrogenion-acidosis, hyper/hypokalemia, hypothermia) and 5 Ts' (Tension pneumothorax, cardiac Tamponade, Toxins, Thrombosis (pulmonary), Thrombosis (coronary)).
- 6) Patient remains asystolic after 2 full cycles of CPR. It is appropriate to use vasopressine. Atropine is not indicated in cardiac arrest.
- 7) Ask for more information about the case. Perform a head to toe physical exam and find the DNR bracelet. Look in the purse or cloths for I.D., emergency contact, medications, cards, etc.
- 5) Consideration for ECMO or ventricular assist device is appropriate but the institution doesn't have this option.

6) Ask for medical directives and consider stopping resuscitation efforts, considering non response to treatments, asystole, non shockable rhythm found at the scene.(Morrison et al., 2010)

Expected suboptimal performance from a junior resident:

- 1) Ask for more help.
- 2) Difficulties to manage the situation: correct the CPR technique, teaching other members of the team.
- 3) Significant deviations of the current resuscitation guidelines: use of atropine, defibrillation in asystole, pacemaker.
- 4) Doesn't ask for medical directives and continues resuscitation despite prolonged efforts.

Scripts for actors

Senior resident

Resident arrives.

RT giving CPAP with an MIE, nurse at the bedside, patient has an IV in place, junior physician performing chest compression at 60 /min and very soft. Defibrillator pads are applied, the patient has an I.V. in the left antecubital vein and the monitors shows asystole.

Nurse: Thanks for coming doctor. The paramedics just brought this patient to ER. She's a 65 y/o lady who fainted at the nearby Tim Horton's, they started CPR, the AED didn't order shock and the patient was moved very rapidly, they said that in less than 5 min.

Resident: Do you have more information about the patient?

Nurse: No, she just arrived. She was alone, no relatives or friends were with her.

Resident: Did she receive any shocks or any medications?

Nurse: No she just arrived! We started CPR, the monitors, the defibrillator and I got an IV in the left antecubital area.

Resident: Hi everybody. I am Dr, anesthesiologist on call; I am taking the leadership for this case. Compressor please push harder: 2 inches deep and allow for complete recoil by lifting the heel of your hand slightly but completely and faster 100 compressions per minute, interrupt every 30 compressions to give 2 effective ventilations. We need compression:

ventilation ratio 30:2, until intubation. You ...the person in the airway get prepared to give 2 ventilations. Nurse prepare the defibrillator pads and the airway equipment next. Let me know when you are ready. Did everybody understand? I want to know your names, start with the nurse, next the compressor, next the airway person. Thank you.

Nurse: I am

Compressor: I am Dr This is my first call in emergency department.

RT: I am ...(Peter)

Resident: After 2 min 4 CPR cycles compressor check carotid pulse, expose the patient chest and arms, perform a focused physical exam: airway, breathing, pulse, auscultation, disability, exposure. Confirms the monitors and defibrillator and check the rhythm. RT checks the airway.

RT: Airway is open, patent no dentures or secretions. Do you want an LMA or a tube?

Resident: An endotracheal tube 7.0 and a laryngoscope blade N. 3.

R.T: The airway equipment is ready. I would prefer you do the intubation.

Nurse: The defibrillator is attached.

Compressor: No carotid pulse.

Resident: Please select PADS in the lead selection. The patient seems to be in asystole, continue CPR, prepare ECG lead, and we will intubate next.

Resident: Compressor and RT continue resuscitation. Nurse do you have the DII in the ECG leads?

Nurse: Yes.

Resident: It is asystole. Let me see the CPR guidelines.

Resident: consult the guidelines.

Resident: Nurse please take blood samples for CBC, blood gas, lytes, glucose, creatinine, cardiac enzymes and starts Normal Saline 500 ml now and let me know when it is in. Give epinephrine 1 mg push.

After given epinephrine.

Resident: Nurse checks jewelry for medical alerts and the purse for I.D. and contact information.

They find the DNR bracelet and the DNR card in the purse.

Resident: This patient is DNR. She has information that she has terminal breast cancer. We need to confirm the patient's identity.

The resident and the nurse confirm identity with I.D. card (driver's license) and DNR card. They take the decision to stop resuscitation.

Resident: Stop resuscitation. Nurse please contact the family member and her family doctor.

Alternatively the resident may continue resuscitation until they contact the relative to confirm the directives.

Expected actions for the junior resident:

Proceed to intubation before completing 4 cycles of good quality CPR.

Give epinephrine and vassopresin.

Take long time to look for information in the patient's purse.

Don't examine for medic alerts.

Case Scenario 3: Asystole/ DNR.

	Baseline	Stage 1	Stage 2	Stage 3	Stage 4
Name of Stage	Asystole	Teaching/ Correction	Ask for information/Differentials	Resolution	Termination of resuscitative efforts
Duration	2 min	3 min	3 min	3 min	2 min
Rhythm EKG detail	Asystole	Asystole	Asystole	Asystole	Asystole
HR	0	0	0	0	0
BP Non Invasive	0	0	0	0	0
Pulses	0	0	0	0	0
Sat	0	0	0	0	0
Airway / FiO2 50%	Bag/mask ventilation	Intubation			
RR	0				
EtCO2	N/A	< 10	< 10	< 10	< 10
Resp Sounds/ Chest Exp	Normal				
Temperature	36.5	36.5	36.5	36.5	36.5
Resident (Examinee)		Intubation Correct CPR Technique	Ask for information and physical exam	DNAR Directives	Termination CPR
RT	CPAP no ventilation	Hand/bag ventilation	Hand/bag ventilation	Hand/bag ventilation	Stop Hand/bag ventilation
Nurse	I.V. left antecubital area.	Defibrillator Pads	Drugs: epinephrine LABS		
ER Doctor/Junior resident	Nervous. Chest compressions Bad technique too slow and soft	CPR			
Relative (son/daughter)					Provides information about

					terminal cancer Accepts termination of CPR efforts
Setting: Patient in a stretcher	Patient in a ER				

Lab Results:

pH: 7.30

PCO₂: 50 mm Hg

PO₂: 200 mm Hg

HCO₃: 20 mEq/L

BE: -4

Hg: 115 g/L

Hct: 34 %

Na: 135 mM/L

K: 5.0 mM/L

Cl: 98 mM/L

Glucose: 5.0 mM/L

Prescription

Date: Sept 1, 2012

Name: Elizabeth Taylor

Allergies: None

Lyrica caps 75 mg # 60

Take 1 capsule Q 12 h.

Dexamethasone Tablets 4 mg # 60

Take 1 tablet PO q 12h

Tramacet (tramadol 37.5 mg + acetaminophen 325 mg) Tabs # 90

Take 1 or 2 tabs Q 6h PRN.

Prevacid (lansoprazole) 15 mg Fas Tab # 30

Take one Fas Tab before breakfast (daily).

Zofran (Ondansetron) Tablets 8 mg #90

Take one tablet Q 8h.

Fold card down center line

Portable-DNR		Portable-DNR	
NEW HAMPSHIRE DO NOT ATTEMPT RESUSCITATION ORDER As this person's attending physician or ARNP and as a licensed physician or ARNP, I order that this person SHALL NOT BE RESUSCITATED in the event of cardiac or respiratory arrest.		Patient Address Patient Phone Number	
Patient Name (Print) Patient Signature / Date		Physician/ARNP Address Physician/ARNP Phone Number	
Physician/ARNP Name (Print) Physician/ARNP Signature / Date		Health Care Agent Address Health Care Agent Phone Number	
If applicable: Health Care Agent Name (Print) Health Care Agent Signature / Date			

Do Not Resuscitate Confirmation Form



Ministry of Health
and Long-Term Care



Office of the
Fire Marshal

Serial Number _____

Do Not Resuscitate Confirmation Form To Direct the Practice of Paramedics and Firefighters after February 1, 2008 *Confidential when completed*

When this form is signed by a physician (M.D.), registered nurse (R.N.), registered nurse in the extended class (R.N. (EC)) or registered practical nurse (R.P.N.), a paramedic or firefighter **will not** initiate basic or advanced cardiopulmonary resuscitation (CPR) (see point #1) and **will** provide necessary comfort measures (see point #2) to the patient named below:

Patient's name – please print clearly

Surname

Given Name

1. "Do Not Resuscitate" means that the paramedic (according to scope of practice) or firefighter (according to skill level) **will not** initiate basic or advanced cardiopulmonary resuscitation (CPR) such as:

- Chest compression;
- Defibrillation;
- Artificial ventilation;
- Insertion of an oropharyngeal or nasopharyngeal airway;
- Endotracheal intubation;
- Transcutaneous pacing;
- Advanced resuscitation drugs such as, but not limited to, vasopressors, antiarrhythmic agents and opioid antagonists.

2. For the purposes of providing comfort (palliative) care, the paramedic (according to scope of practice) or firefighter (according to skill level) **will** provide interventions or therapies considered necessary to provide comfort or alleviate pain. These include but are not limited to the provision of oropharyngeal suctioning, oxygen, nitroglycerin, salbutamol, glucagon, epinephrine for anaphylaxis, morphine (or other opioid analgesic), ASA or benzodiazepines.

The signature below confirms with respect to the above-named patient, that the following condition (check one ☒) has been met and documented in the patient's health record.

- ☐ A current plan of treatment exists that reflects the patient's expressed wish when capable, or consent of the substitute decision-maker when the patient is incapable, that CPR not be included in the patient's plan of treatment.
- ☐ The physician's current opinion is that CPR will almost certainly not benefit the patient and is not part of the plan of treatment, and the physician has discussed this with the capable patient, or the substitute decision-maker when the patient is incapable.

Check one ☒ of the following:

☐ M.D. ☐ R.N. ☐ R.N. (EC) ☐ R.P.N.

Print name in full

Surname

Given Name

Signature

Date (yyyy/mm/dd)

- Each form has a unique serial number.
- Use of photocopies is permitted only after this form has been fully completed.

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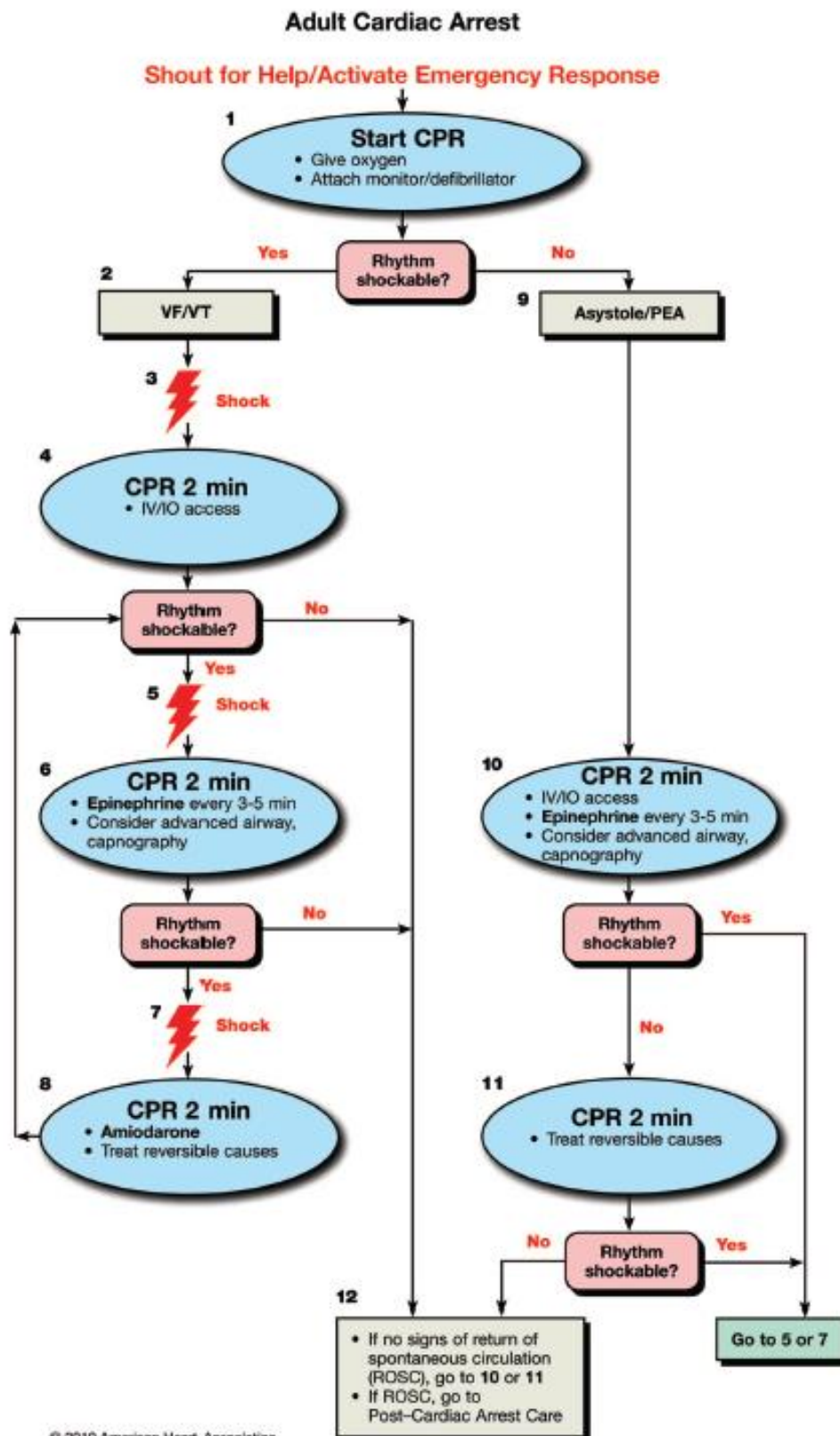


Figure 1. ACLS Cardiac Arrest Algorithm.

CPR Quality

- Push hard (≥ 2 inches [5 cm]) and fast (≥ 100 /min) and allow complete chest recoil
- Minimize interruptions in compressions
- Avoid excessive ventilation
- Rotate compressor every 2 minutes
- If no advanced airway, 30:2 compression-ventilation ratio
- Quantitative waveform capnography
 - If $PETCO_2$ < 10 mm Hg, attempt to improve CPR quality
- Intra-arterial pressure
 - If relaxation phase (diastolic) pressure < 20 mm Hg, attempt to improve CPR quality

Return of Spontaneous Circulation (ROSC)

- Pulse and blood pressure
- Abrupt sustained increase in $PETCO_2$ (typically ≥ 40 mm Hg)
- Spontaneous arterial pressure waves with intra-arterial monitoring

Shock Energy

- **Biphasic:** Manufacturer recommendation (120-200 J); if unknown, use maximum available. Second and subsequent doses should be equivalent, and higher doses may be considered.
- **Monophasic:** 360 J

Drug Therapy

- **Epinephrine IV/IO Dose:** 1 mg every 3-5 minutes
- **Vasopressin IV/IO Dose:** 40 units can replace first or second dose of epinephrine
- **Amiodarone IV/IO Dose:** First dose: 300 mg bolus. Second dose: 150 mg.

Advanced Airway

- Supraglottic advanced airway or endotracheal intubation
- Waveform capnography to confirm and monitor ET tube placement
- 8-10 breaths per minute with continuous chest compressions

Reversible Causes

- Hypovolemia
- Hypoxia
- Hydrogen ion (acidosis)
- Hypo-/hyperkalemia
- Hypothermia
- Tension pneumothorax
- Tamponade, cardiac
- Toxins
- Thrombosis, pulmonary
- Thrombosis, coronary

APPENDIX 7

Case 2. Post-operative morphine overdose after a knee operation. Patient refused regional, epidural and a PCA was ordered.

Background:

Opioid analgesics are the cornerstone pharmacologic treatment for severe post-operative pain. (Wheeler, Oderda, Ashburn, & Lipman, 2002) Respiratory depression is the most feared complication of opioid treatment. (Dahan, Aarts, & Smith, 2010) Patient controlled analgesia (PCA) with opioid medications (morphine) is the most common method to control severe post-operative. Although this modality is considered more effective and safe than intermittent bolus administered by nurses, multiple reports of serious complication including mortality have been published. (Syed et al., 2006) (Looi-Lyons LC, Chung FF, Chang V, 1996) The process of programming and administering a PCA is complex and susceptible to human (operator) and equipment errors with potential harm for patients and the risk and cost for hospitals and health care providers. It has been estimated that 6.5% of errors were due to operator factors, mainly mis-programming, and 76% attributed to device malfunction. (Schein JR, Hicks RW, Nelson WW, Sikirica V, 2009)

We design a simulation scenario focused in morphine overdose (MOD) as clinical diagnosis, secondary to PCA malfunction or misprogramming. The harmful event needs to be treated and disclosed to the parent. The scenario is divided in three parts: part 1: the medical crisis: respiratory depression, part 2: Preparation for disclosure, and part 3: Disclosure. CanMEDS competencies related to the scenario are described.

Objectives:

Part 1: Respiratory depression secondary to morphine over dose.

1. Medical Expert: Recognize and manage opioid overdose. (Dahan et al., 2010)

2. Scholar: Appropriate use of reminders: use of pre printer orders to treat respiratory depression secondary to morphine overdose.
3. Scholar: Teach other health care professionals diagnosis and treatment of morphine over dose.
4. Health Advocate: Patient safety: Recognize medication error. (Syed et al., 2006)
5. Health Advocate/ Collaborator: Invite other members of the team to speak up to identify errors and omissions.
6. Health Advocate: Mobilize resources: Increase monitoring (one to one nurse in the room, RT available, and cardiac monitoring).

Part 2: Disclosure preparation.

1. Scholar: Appropriate use of reminders: search for Canadian disclosure guidelines, disclosure tool kit or institutional guide lines to prepare the disclosure. Alternatively call CMPA to receive orientation. Second alternative: call a senior staff for advice.(The Canadian Medical Protective Association, 2008)

Part 3: Disclose harmful event to the parent

1. Professional/ Communicator: Disclose medical error to family member.
2. Characteristics:
 - a. Present the facts, do not speculate.
 - b. Communicate in a clear, empathetic manner, avoiding information overload.

3. Steps:

- a. Introduce yourself and the topic.
- b. Express your regret.
- c. Describe clinical condition, current management and future care requirements.
- d. Impress your patient how seriously you are taking the situation.
- e. Welcome questions frequently and openly.
- f. Summarize the discussion.
- g. Provide contact information.
- h. Consider follow up meeting.

2. Health Advocate:

- a. Use interpreter if necessary (mobilize resources, respond to patients' needs).
- b. Offer practical and emotional support such as spiritual care services, counseling and social work as needed.
- c. Facilitate further investigation and treatment if required.

Expected actions form senior resident:

- 1) Ask for information about the case.
- 2) Examine the patient.
- 3) Diagnose respiratory depression secondary to morphine.
- 4) Start treatment with naloxone 2 mcg/kg (120mcg).

- 5) Identify and address medical error: Review the chart and the PCA orders which are correct. Review the PCA pump and identify 20 mg of morphine administered in one hour. Stop the infusion, disconnect the pump and send it to Biomedical department for check up. Order a new PCA pump.
- 6) Prepare the disclosure using the information available including the disclosure toolkit, Canadian disclosure guidelines, CMPA website, TOH website, calling CMPA.
- 7) Disclose medication error to the family member and the patient.
- 8) Start morphine PCA and explain the family member the use.
- 9) Propose to write an incident report.

Expected action from junior resident:

- 1) Manage resuscitation and respiratory depression appropriately.
- 2) Difficulty to disclose medication error to the family.
- 3) Doesn't start alternative treatment: PCA or need prompts to start the treatment.

Case Description:

15 year old, 60 kg male that has been transferred to the hospitalization ward and is at the sixth post-operative hour of anterior cruciate ligament reconstruction of the left knee. The patient had history of left knee injury while playing soccer 6 m ago. The patient is a recent immigrant from a remote country and doesn't speak English or French. His past medical

history is unremarkable. He rejected epidural and regional block. In the post-operative period the anesthesiologist ordered patient controlled analgesia management with morphine 1 mg IV PCA bolus, lock out 8 min and maximum dose per hour 8 – 10 mg. Additional pain medications included acetaminophen 650 mg Q 4h, and ketorolac 30 mg IV Q 6 h.

The patient was found by a covering nurse bradypneic (respiratory rate of 6/min) and cyanotic Sat 86% and requiring Oxygen to maintain his saturation above 93 %, HR 60/min and BP 80/60 with sedation score 1-3 and difficulties waking him up.

Stat call to anesthesia, spot team and respiratory therapy was requested. You find the patient on the bed, monitored with EKG, HR 60/min, BP 85/60, weight 60 Kg, with hand-bag ventilation by the RT, RR 6 breaths /min and the pupils are pin pointed. The nurse in charge of the patient is currently on her break, there is a nurse covering the case who knows minimum details about the case. Family member is in the room and asked about what happened to her son, and is not cooperative.

Part 1: Respiratory depression secondary to morphine over dose.

Scenario Script:

Resident: “Hi I’m Dr. XXX anesthesia resident, did you page me stat?”

Nurse: “Thanks for coming Dr. XXX. This patient is 15 y/o 60 kg boy, 6 h post-operative of ACL reconstruction by Dr Smith. He doesn’t speak English or French. His nurse just went on supper break and asked me to cover. I came in because his alarm went off, and I found him very drowsy, cyanotic and bradypneic, and I called for help.”

Mother: “What is going on with my son? He was sleeping and the machine keeps ringing!”

Resident: “Hi I am Dr XXX I was called because of this monitor alarms. Your son is too sleepy and we need to check this out.”

Mother: “Is he going to be OK?”

Resident: “I cannot give more information until I examine him and review what is happening”

Mother: “starts crying and being disruptive”.

Resident: “I’m sorry mom, but I may need to ask you to step out of the room for a few minutes so I can better assess your son and figure out what is happening”.

A nurse “confederate” will take the mother out of the room.

RT: “The patient was bradypneic, initially desaturated at 86% with the airway open and he is easy to ventilate, and responded to 100 % O2 and hand bag ventilation, his saturation now is 95%.”

Resident: “What are the vitals? Can you do new set of vitals right now?”
Proceeds to examine the patient: Check patient’s response: Are you OK? No response, no spontaneous breathing, Airway: open, Breathing: RR 6 / min, Circulation is stable HR 60/min BP 90/60, Sat 96%. Pulse is present and normal. D: Disability: Patient doesn’t respond to verbal and mild tactile stimulation but responds to painful stimulation moaning. Pupils are pinpointed. Head / neck: normal, chest: normal heart and lung sounds. Patient has

normal chest expansion to manual bag / mask ventilation. Abdomen: Normal. Extremities: elastic band dressing the left knee.

Resident: “I am suspecting a morphine overdose, but I need more information about the case. May I have the chart please?”

Nurse: “Here is the chart.”

Chart: The chart contains OR note, anesthesia record uneventful procedure. History and physical: PCA ordered in pre-printed orders Morphine 1mg IV PCA bolus q 8 min maximum dose 10 mg in 1 h. Consent form. Pre-admission history/ physical. Medical orders. Nursing and medications records.

The chart is in order and there is no clear cause of the event.

Resident: “Let’s stop the PCA pump and check the history to see how much he has had”.

Nurse: “Do you want to check the chart while I check the pump?”

Resident: “Yes, please, I will check the chart.”

Nurse: He had a total dose of 20 mg with 2 activations in the last 30 min.

Resident: That confirms morphine overdose. We need to treat it with naloxone according to the pre-printed orders: 2 mcg/kg: 60 Kg x 2= 120 mcg Vial 0.4 mg diluted to 10 ml to give 3 ml IV q 2 min up to four times.

Patient responds to treatment, breathing spontaneously RR 16 / min, opens his eyes, BP 110/70, HR 80.

Nurse: “What do you want me to do?”

Resident: “I want this patient monitored, with one to one nurse and the respiratory therapist to stay with the patient until I come back to reassess”.

Nurse confederate: “Doctor, the mother was very upset and she wants to speak with you. She is making a couple of phone calls and she will be back in 10 minutes. What do you need to meet with the mother?

Resident: I need the chart and a private room.

If the resident doesn't request a room, the nurse gives the chart to the resident.

Nurse confederate: We can arrange you to use the conference room to speak with her.

Resident: OK. Thanks

ONLY if the resident asks “Have you notified the patient’s surgeon about what has happened?”

Nurse: Yes, “We called the surgeon, and he is aware of what has happened, but he can't come because he is in the OR at another site for the whole day. He will come after his OR to see the patient. He is asking anesthesia to take over the pain management.”

Part 2: Disclosure preparation. Disclosure Planning Scenario:

Expected actions:

Option 1: Call CMPA for advice.

CMPA: “Welcome to the Canadian Medical Protective Association. Please note that your call may be recorded for quality control and training purposes. For all enquiries regarding membership or proof of membership, please press 1. If you are calling to speak with one of our physicians or are seeking medical legal advice, please press 2. For all other enquiries, please press 0.”

CMPA: “Hello, I am Dr. Advisor, I am one of the CMPA physicians. How can I help you?”

Resident: “Hi, my name is Dr. XXX, I am calling because of a harmful incident that happened to a patient that was post-op after a knee operation. This is a 15 year male patient, who underwent ACL reconstruction yesterday. Both the surgery and the anesthesia were uneventful. I was called because the nurse found the patient with respiratory depression, shortly after the patient was given a large dose of morphine, according to the chart, it was given IV. We suspect a morphine overdose. We gave naloxone and the patient improved and is currently stable. We are in the process of transferring of the patient to ICU. The patient doesn't speak English or French, so there have been some issues with communication. He didn't want a regional block or an epidural. We started a PCA at 1.0 bolus, lock out 8 min maximum dose in 1 h 10 mg and he was not considered a good candidate for PCA because of the language barrier.”

CMPA: Dr. Advisor: “Thank you for calling us, sorry to hear about your case. How can I help you, Dr.XXX?”

Option 2: calls TOH Risk Manager

Phone in conference room: extension XXXXX for switchboard

“Hello, this is XXX, the TOH risk manager.”

Option 3: Internet search.

1. CMPA website
2. TOH site
3. CPSI website
4. HI website
5. Other patient safety website, eg. VHA
6. Patient advocate website

Option 4: Utilizes disclosure binder

Option 5: calls staff/senior colleague:

Staff: “Sorry, to hear that happened to you. Do you need help managing the patient right now?”

Resident: “Thanks, but the patient is stable right now and we are transferring to ICU. The rapid response team leader has taken over care. The family wants to meet with me, the surgeon is not available, and I think the family is pretty upset.”

Staff: “It’s good that the patient is stable. My advice is to review the chart, be careful not to speculate without verifying facts, and I think it is a good idea to contact CMPA, or at least look at their website. I think TOH also has a disclosure toolkit. It is

usually in a binder on most units. Why don't you have a look at those resources? I need to go and start this induction, but if you have any other questions, give me another call."

Part 3: Disclose harmful event to the parent

Script:

Good/acceptable performance:

Knock at door, the nurse opens the door, and brings the mother into the room.

Nurse: "Dr. XXX, Mohammed's mother is here(Nurse then leaves, unless the resident asks her to stay).

Resident: Mrs. Abdullah, I am Dr. XXX. I am one of the anesthesia residents. I was called to see your son."

Mother: "What happened?" I am really worried about my son. Is he OK? I called my husband and he is on his way.

Resident: "Mrs Abdulah, your son had a medication incident that I will explain to you, but I want to tell you that he is OK and stable right now. Do you want me to explain what happened?

Mother: Yes Dr please.

Resident: The nurse called me because she found your son to be not responding and he was very slow breathing. I came and we supported his breathing. We tried to figure out what happened. I understand that he was having a lot of pain, and we were using a specialized computer control pump that gives the medication in a controlled fashion. We

examined him he had signs of morphine effects which are somnolence, pin pointed pupils, slow breathing and low heart rate. We gave him an antidote to reverse the pain medicine, and he woke up. He is now awake and breathing on his own. He is doing OK.”

Mother: “I don’t understand how that could happen?”

Resident: “Mrs. Abdullah, we are very sorry that this happened to your son. We aren’t sure what exactly happened that Mohammed had this reaction. We need to investigate further before we have an answer, including talking to his nurse and his surgeon.”

Mother: “Will he be OK?”

Resident: “Yes, I think he will be fine. He responded very quickly with the antidote, and is doing well. We will increase his monitoring with a nurse in the room and the respiratory therapist will available and checking him for 4 h. He will have the oxygen and cardio-pulmonary monitoring all the time. We want to make sure he doesn’t have the problem again.”

Mother: “He was in pain after moving from recovery and then he got too much pain medicine this morning, what are you going to do for his pain now?”

Resident: “We will give him other pain medicine that will not affect his breathing, and if these medications don’t manage his pain. We will change the pump and send the old one to check up by Biomed department. We will check carefully the program to make sure the medication he will receive is the one we order. The pump has a mechanism to avoid excess of medication. But we will need to get a translator to make sure that he

understands how this machine works and that he agrees to try it. Does that sound OK to you?”

Mother: “What happens next?”

Resident: “We need to talk to your son’s nurse and his surgeon to try to figure out why this happened to your son. We will meet with you again to talk about what we found out.”

Mother: “How will you make sure that this doesn’t happen again?”

Resident: “We will follow up what happened today, according to the hospital policy, and will report this incident to the Risk Manager, and once we have a better understanding, we will meet with you again. We are very sorry that this happened to your son. I am going to give you my contact information, and we would like to know how best to contact you. Please be assured that our anesthesia pain service will be following your son. Do you have any other questions? Was there anything that was unclear?”

Suboptimal performance (expected junior resident):

Knock at door, the nurse opens the door, and brings the mother into the room.

Nurse: “Dr. XXX, this is Mohammed’s mother, Mrs. Abdullah.”

(Nurse then leaves.)

Resident: “Hello, Mrs. Abdullah, I am Dr. XXX. I am one of the anesthesia residents. I was called to see your son.”

Mother: “What happened?”

Resident: “The nurse called me because she found your son to be unresponsive and bradypneic. I came and we bagged him. We tried to figure out what happened. It looks like he had an overdose of morphine. Respiratory depression is a common and well known complication of opioid medications. We gave him naloxone and he responded immediately and he’s fine now.”

Mother: “I don’t understand how that could happen?”

Resident: “Mrs. Abdullah, your son didn’t accept a regional block or an epidural. We ordered morphine PCA and for some reason there was a problem with pump that was giving more medication than ordered. So, your son received an overdose of morphine.”

Mother: “Will he be OK?”

Resident: “Yes, he is stable, and we are transferring him to the ICU.”

Mother: “What happens next?”

Resident: “We will fill out an incident report.”

Mother: “How will you make sure that this doesn’t happen again?”

Resident: “I am sorry that this happened to your son, but like I mentioned, respiratory depression is a well known side effect of opioid medications. Unfortunately, these things happen. I think you should focus on that he is fine now.”

Template Anesthesia Simulator. Morphine Overdose.

	Location/ Setting	Technician	Patient	Participant	Parent	Nurse 1	RT
0 min	Hospital floor bed	Child or adult size patient	Eyes closed HR 60, BP 80/40, Sat 95%, EtCO2 45 mm hg, RR 6/ min				
		Eyes closed	HR 60, Eyes closed, BP 85/4, Sat 95%, EtCO2 50, RR 6	Arrives ask what happened	Crying, nervous, disruptive	Report Pt condition	Report low RR and desaturation. Airway open easy to ventilate
			Same as before	Ask mother to leave the room	Leaves the room		
			Same as before	Examine PT. Stop PCA pump.			
5 min		Patient open the eyes, HR and BP increase RR 20	HR 85, BO 110/70, Sat 100 %, Eyes open	Diagnose and treat morphine overdose			
			Possible screaming for pain.	Increase monitor 1:1 nurse and RT stay with the patient for 1 h and available Change the pump Inform the MRP Incident report			
10min	Conference/office or debriefing room			Preparation for disclosure			
5 min	Conference/office or debriefing room			Disclosure information to parent	Disappointed and upset. Understand situation.		
20 min	Conference/office or debriefing room			Debriefing			

Appendix 8. Revised GIOSAT

Scenario: _____ N: _____ Specialty: Anesthesia

Rater N.:_____

Rating	1	2	3	4	5	6
Descriptor	Very poor	Poor	Marginal	Acceptable	Good	Very Good
Performance	Clearly Endangered Patient safety.	Clearly unacceptable performance.	Indicated cause of concern.	Satisfactory but significant improvements required to reach mastery level.	Satisfactory but minor improvements required to reach mastery level.	Consistently high standard. Enhancing patient safety. Example for others

Intrinsic Competencies

- | | | | | | | | |
|--|----------|----------|----------|----------|----------|----------|------------|
| 7. Communicator: | 1 | 2 | 3 | 4 | 5 | 6 | N/A |
| Crisis: Clear / Concise, verbal and non-verbal, closed loop technique, share information “think aloud”, orient new members , exchange information, listen team input.
Interview, Disclosure: Slow and clear speaking with plain language. Checks for understanding. Sits down, eye contact, appropriate body language. | | | | | | | |
| 8. Collaborator: | 1 | 2 | 3 | 4 | 5 | 6 | N/A |
| Should stay calm and in control during crisis, demonstrate authority and leadership or responds appropriately to leadership. Prevent and manage conflict effectively. Clear understanding of his/her roles within the team. Recognize one’s own limits. Support each other. Take control of the situation. Delegate tasks effectively. Shared decision making. | | | | | | | |
| 9. Manager | 1 | 2 | 3 | 4 | 5 | 6 | N/A |
| Formulate a plan in advance; establish priorities with appropriate utilization of key resources. Ask for help appropriately. | | | | | | | |
| 10. Professional: | 1 | 2 | 3 | 4 | 5 | 6 | N/A |
| Maintain codes of behavior: mutual respect, conflict resolution, honesty, integrity and compassion.
Demonstrate awareness of limitations. Respect ethics, legal codes, rules and procedures of the system.
Disclose errors or adverse events. Maintain standards of care | | | | | | | |
| 11. Health Advocate: | 1 | 2 | 3 | 4 | 5 | 6 | N/A |
| Attention to patient’s/team safety. Identify risk and special needs and mobilize resources appropriately.
Recognize and address errors and adverse events. | | | | | | | |
| 12. Scholar | 1 | 2 | 3 | 4 | 5 | 6 | N/A |
| Teaching health care professionals and patients. Application and translation of evidence based medical information beyond the algorithms e.g. critically evaluate information and its sources, and apply this appropriately to practice decisions. Appropriate use of reminders. | | | | | | | |

Appendix 1.

Scenario: _____ N: _____ Specialty: Anesthesia Rater N.: _____

Rating	1	2	3	4	5	6
Descriptor	Very poor	Poor	Marginal	Acceptable	Good	Very Good
Performance	Endangered Patient safety clearly.	Clearly unacceptable performance.	Indicated cause of concern.	Satisfactory but could improve.	Satisfactory but minor improvements required to reach mastery level.	Consistently high standard. Enhance patient safety. Example for others

Medical Expert Competencies

- | | | | | | | | |
|---|----------|----------|----------|----------|----------|----------|------------|
| 9. Situation Awareness | 1 | 2 | 3 | 4 | 5 | 6 | N/A |
| Attention / Vigilance. Frequent scan of environment (monitors). Anticipates likely events. | | | | | | | |
| 10. Medical History | 1 | 2 | 3 | 4 | 5 | 6 | N/A |
| Gathering information, medical history. | | | | | | | |
| 11. Examine Patient / Equipment | 1 | 2 | 3 | 4 | 5 | 6 | N/A |
| Quick problem directed physical exam. Quick check of equipment / monitors. | | | | | | | |
| 12. Diagnosis / Differentials | 1 | 2 | 3 | 4 | 5 | 6 | N/A |
| Recognize the problem and communicates. Consider differentials. | | | | | | | |
| 13. Confirmation / Investigations | 1 | 2 | 3 | 4 | 5 | 6 | N/A |
| Orders and interprets appropriately pertinent Labs / Images / Monitors. | | | | | | | |
| 14. Medical Therapeutic | 1 | 2 | 3 | 4 | 5 | 6 | N/A |
| Compensatory and specific agent or medication, time, dose, route and response. May use checklists and reminders. | | | | | | | |
| 15. Procedure Therapeutic | 1 | 2 | 3 | 4 | 5 | 6 | N/A |
| Compensatory and specific procedure / intervention, time, technique and response. May use checklists and reminders. | | | | | | | |
| 16. Deal with changing situations | 1 | 2 | 3 | 4 | 5 | 6 | N/A |
| Reassess / re-evaluate. Recognize changes. | | | | | | | |

APPENDIX 9 Analytic Rubrics

Competency	Aspect	1	2	3	4	5	6
Professional Code of behaviors-self assessment and self-awareness.	Honesty Not tell the truth or speculates and blame others. Not verify that the receiver understands the facts.	Not demonstrate honesty. Provide false information	Rarely demonstrate honesty Provide inaccurate information with major omissions . (minimize risks).	Occasionally demonstrate honesty. Provide unclear information with some omissions .	Often demonstrate honesty. Provide information with minimal omissions .	Frequently demonstrate honesty Provide information with no omissions	Always demonstrate honesty. Provide complete, clear information , and ensures that the receiver understands it.
	Empathy	Not demonstrate empathy.	Rarely demonstrate empathy.	Occasionally demonstrate empathy.	Often demonstrate empathy.	Frequently demonstrate empathy	Always demonstrate empathy.
	Respect Offensive, rude, angry, hostile, sarcastic.	Participant is extremely disrespectful .	Participant is very disrespectful . i.e. rude but not aggressive.	Participant is disrespectful .	Participant is respectful .	Participant is very respectful .	Participant is extremely respectful . i.e. polite, considerate
	Awareness of ethical and legal codes	Fail to recognize or respond to advanced directives, DNR, or consent.	Recognize and respond to advanced directives, DNR, or consent with significant delay .	Recognize and respond to advanced directives, DNR, or consent with delay .	Recognize and respond to advanced directives, DNR, or consent quickly	Recognize and respond to advanced directives DNR, or consent very quickly .	Recognizes and responds to advanced directives, DNR, or consent immediately .
		Always respond very inappropriately to advanced directives, DNR, or consent.	Frequently respond inappropriately to advanced directives, DNR, or consent.	Rarely respond inappropriately to advanced directives, DNR, or consent.	Often respond appropriately to advanced directives, DNR, or consent	Always respond appropriately to advanced directives, DNR, or consent.	Respond very appropriately to advanced directives, DNR, or consent.
	Disclosure of error or adverse events	Not follow the disclosure process for the harmful incident.	Disclose the harmful incident with major mistakes and omissions .	Disclose the harmful incident with some mistakes and omissions .	Disclose the harmful incident with minimal mistakes and omissions .	Disclose the harmful incident with no mistakes or omissions .	Effectively disclose and follow all the steps in the disclosure process.
Health Advocate	Patient safety: Identify and address patient's risks and special needs and mobilize resources.	Unable to identify patient's risks and special needs.	Identify patient's risks and special needs with major omissions and mistakes .				Identify all patient's risks and special needs with confidence .
		Not mobilize resources to optimize	Mobilize few resources to				Mobilize all necessary resources, in a timely

Competency	Aspect	1	2	3	4	5	6
		the management of the case.	optimize the management of the case.				and effective manner.
Health Advocate	Formulation of a prevention plan.	Not establish a prevention plan.	Establish a prevention plan with major omissions and mistakes.	Established a prevention plan with some omissions and mistakes (incomplete plan).	Established a prevention plan with few omissions and mistakes.	Established a prevention plan with no omissions and mistakes.	Rapidly and effectively establish a prevention plan with no omissions and mistakes.
	Initiates discussion with other team members about the case, including errors or omissions.	Not initiate discussion with other team members about the case, including errors or omissions.	Initiate discussion with other team members about the case, including errors or omissions but with major hesitation.	Initiate discussion with other team members about the case, including errors or omissions but with some hesitation.	Initiate discussion with other team members about the case, including errors or omissions with no hesitation.	Initiate discussion with other team members about the case, including errors or omissions with no hesitation, and encourages feedback.	Initiate and facilitate discussion with other team members about the case, including errors or omissions with no hesitation, and encourages feedback.
	Recognizes and addresses medical errors and omissions	Not look for or identify medical errors and omissions.	Identify some medical errors or omissions with significant difficulty and delay.	Identify few medical errors or omissions with moderate difficulty and delay.	Identify several medical errors or omissions with minimal difficulty and delay.	Identify all medical errors or omissions without difficulty and delay.	Identify clearly and rapidly all medical errors or omissions.
	Generates an incident report.	Not generate an incident report.	Generate an unclear incident report with major omissions	Generate a clear incident report with some omissions	Generate a clear incident report with few omissions	Generate a clear incident report with no omissions	Efficiently and rapidly generates a complete and clear incident report.
Scholar	Demonstration of teaching skills with health care professionals, students, and patients. Corrects inappropriate CPR technique and demonstrate the correct technique, (ACLS 2010).	Not teach and fail to manage students or staff. i.e . Not recognize inappropriate CPR technique, not correct or teach team.	Teach and manage students or staff with major difficulty.	Teach and manage students or staff with some difficulty.	Teach and manage students or staff with minor difficulty.	Teach and manage students or staff without difficulty.	Teach and manage students or staff without difficulty and demonstrates excellence in teaching.

Competency	Aspect	1	2	3	4	5	6
Scholar							
	Demonstration of evidence based medicine (critical evaluation of information and its sources). i.e.Clinical guidelines, hospital policies, pre-printed orders, CMPA.	Not seek and apply appropriate information	Seek and apply appropriate information with major difficulty	Seek and apply appropriate information with some difficulty e	Seek and apply appropriate information with minimal difficulty	Seek and apply appropriate information without difficulty	Seek and apply appropriate information rapidly and effectively
	Reminders	Never search, interpret and use evidence base, and current information	Rarely search, interpret and use evidence base, and current information	Occasionally search, interpret and use evidence base, and current information	Often search, interpret and use evidence base, and current information	Frequently search, interpret and use evidence base, and current information	Always search, interpret and use evidence base, and current information

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Appendix 10. SPIKES Disclosure Rubrics.

CanMEDS Competencies	Aspect	1	2	3	4	5	6
Scholar, Professional, Health Advocate & Manager	Settings (already established for this scenario)	Examinee doesn't request patient's chart, supporting information to prepare the debriefing, a private room or the presence of nurse or the risk manage (optional).	Examinee requests with major omissions patient's chart, supporting information to prepare the debriefing, a private room and the presence of nurse or the risk manage (optional).	Examinee requests with some omissions patient's chart, supporting information to prepare the debriefing, a private room and the presence of nurse or the risk manage (optional).	Examinee requests with minimal omissions patient's chart, supporting information to prepare the debriefing, a private room and the presence of nurse or the risk manage (optional).	Examinee requests with no omissions patient's chart, supporting information to prepare the debriefing, a private room and the presence of nurse or the risk manage (optional).	Examinee effectively requests the patient's chart, supporting information to prepare the debriefing; a private room and the presence of nurse or the risk manage (optional). Examinee asks if the parent needs someone to bring with her/ him.
		Examinee doesn't introduce him/her self. Examinee doesn't refer to the patient and relatives by names.	Examinee introduces him/her self with major omissions i.e. give his/her name but not his/her position or names of others health members, doesn't refer to the patient and relatives by names.	Examinee introduces him/her self with some omissions i.e. names of patient and relatives.	Examinee introduces him/her self with minimal omissions. i.e. names of others health members	Examinee introduces him/her self with not omissions	Examinee introduces her/himself and others health members, establish a communication with courtesy and empathetic manner. Examinee refers to the patient and relatives by name.
Communicator	Perception and invitation	Examinee doesn't ask or listen what the patient or relative already knows about the incident.	Examinee rarely asks or listen what the patient or relative already knows about the incident.	Examinee occasionally asks or listen what the patient or relative already knows about the incident	Examinee often asks or listen what the patient or relative already knows about the incident	Examinee frequently asks or listen what the patient or relative already knows about the incident	Examinee asks what the patient or relative already knows about the incident and listen reflectively.

Communicator-Scholar - Health Advocate & Professional	Knowledge transmission	Examinee never uses clear and appropriate vocabulary. Always uses jargon, speculates and blames others.	Examinee rarely communicates clearly and appropriately. Frequently uses jargon, speculates and blames others.	Examinee occasionally communicates clearly and appropriately. Often uses jargon, speculates and blames others.	Examinee often communicates clearly and appropriately uses jargon, speculates and blames others.	Examinee frequently communicates clearly and appropriately. Rarely uses jargon, speculates and blames others.	Examinee always communicates clearly and appropriately. i.e Restricts the discussion to the facts never uses jargon, speculation and blaming others.
		Examinee overloads with extremely amount of information or doesn't provide information at all.	Examinee provides information with moderate overload or with major omissions	Examinee provides information slightly overloaded or with moderate omissions	Examinee provides information slightly overloaded or with minors omissions	Examinee provides enough information	Examinee provides effectively adequate information
		Examinee never reassure that the incident will be investigated so it will not happen again					Examinee always reassures that the incident will be investigated so it will not happen again.
		Examinee doesn't ask for understanding and never allows patient/ relative to ask questions.	Examinee rarely asks for understanding and never allows patient/ relative to ask questions.	Examinee occasionally asks for understanding and never allows patient/ relative to ask questions.	Examinee often asks for understanding and never allows patient/ relative to ask questions.	Examinee frequently asks for understanding and never allows patient/ relative to ask questions.	Examinee always asks for understanding and allowing patient/ relative to ask questions.
		Examinee never demonstrates attentive listening. Interrupts the patient all the time.	Examinee rarely demonstrates attentive listening. Interrupts the patient frequently	Examinee occasionally demonstrates attentive listening. Interrupts the patient often.	Examinee often demonstrates attentive listening. Interrupts the patient rarely.	Examinee frequently demonstrates attentive listening. Interrupts the patient hardly ever.	Examinee shows attentive and uninterrupted listening.
Professional	Emotions and empathy	Examinee never provides expression of regret or apology	Examinee provides incomplete or inaccurate expression of regret or apology	Examinee provides incomplete or unclear expression of regret or apology	Examinee provides complete expression of regret and apology	Examinee provides complete and clear expression of regret and apology	Examinee always provides expression of regret and give and apology appropriately.
		Examinee never recognizes and acknowledges patient or relative predicament or feelings (emotional	Examinee rarely recognizes and acknowledges patient or relative predicament or feelings (emotional	Examinee occasionally recognizes and acknowledges patient or relative predicament or	Examinee often recognizes and acknowledges patient or relative predicament or feelings (emotional	Examinee frequently recognizes and acknowledges patient or relative predicament or feelings (emotional	Examinee always recognizes and acknowledges patient or relative predicament or feelings (emotional

Communicator (Non-verbal communication)		response)	response)	feelings (emotional response)	response)	response)	response) in a supportive manner. i.e. I can see that you are very angry about this incident.
		Examinee always demonstrates negative non-verbal behaviour. i.e. Appearance objectionable to patient, standing, sitting behind desk, far away or turned away, tense posture, slouched back, critical or distracting gestures (pointing finger, clenched fist, finger-tapping, foot-swinging, looking at watch), bland expression, yawning, frowning, shifty, avoiding eye contact, focusing in notes, or computer, or hand held devices, too low or to fast speech, too frequently or inappropriate touch.	Examinee demonstrates multiple negative non-verbal behaviours and little positive behaviour.	Examinee demonstrates some negative non-verbal behaviours and some positive behaviours	Examinee demonstrates little negative non-verbal behaviours and multiple positive behaviours	Examinee demonstrates mainly positive behaviours.	Examinee always demonstrates a positive non-verbal behaviour. i.e. professional appearance, equal status seating, proximity to patient/parent, relaxed open posture, leaning slightly toward, occasional facilitated gestures, facial animation interest, appropriated eye contact, moderate tone of voice, moderate rate of speech, appropriate touch.
	Summarize and strategize	Examinee doesn't summarize the key points.	Examinee summarizes the key points with major mistakes and omissions.	Examinee summarizes the key points with some mistakes and omissions.	Examinee summarizes the key points with minimal mistakes and omissions.	Examinee summarizes the key points with no mistakes or omissions.	Examinee summarizes clearly and organized the key points.
		Examinee doesn't offer for emotional, social or spiritual support.					Examinee offers for emotional, social or spiritual support.
		Examinee doesn't arrange a follow up or provides contact information.	Examinee arranges a follow up or provides contact information with major mistakes and omissions.	Examinee arranges a follow up or provides contact information with some mistakes and omissions.	Examinee arranges a follow up or provides contact information with minimal mistakes and omissions.	Examinee arranges a follow up or provides contact information with no mistakes or omissions.	Examinee arranges a follow up and provides contact information.

(The Canadian Medical Protective Association, 2008; Disclosure working group, 2011; Strange Khursandi, 2011; Thistlewaite & Spencer, 2008; Jarvis & AJ, 2009;)(Baile, 2000)

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APPENDIX 11. Raters' Rules do not resuscitate scenario

“These descriptors are intended to guide the distinction between borderline candidates. If candidates display behaviours in the 3 (Marginal) column, they do not necessarily score 3; they just *cannot score higher than 3*. If the candidate displays the behaviours in the 4 (Acceptable) column, they do not necessarily get a score of 4, they just *cannot score lower than 4*. Please try to use the full range of the scale”.

Competency	3 Marginal	4 Acceptable
Communicator Verbal and Non-verbal	Crisis: Doesn't use closed loop technique Phone Interview: Speaks fast, uses jargon, doesn't confirm understanding, uses barriers and inappropriate gestures	Crisis: Clear, concise, close loop technique, shares and exchanges information, think aloud, listen team. Phone Interview: Speaks slowly and clearly. Doesn't use jargon, checks for understanding, appropriate non-verbal communication.
Collaborator	Crisis: loss of control. Doesn't demonstrate authority and leadership. Performs multiple tasks without delegating.	Crisis: Calm and control. Authority and leadership. Delegates tasks effectively Asks team members' for information (nurse, RT). Requests consults (ICU?) Post crisis (disclosure): Informs other members of the team about patient's condition (MRP, family physician).
Manager	Doesn't prioritize good CPR technique and gather information to solve the case.	Plans in advance. Appropriate utilization of key resources.
Professional Honesty	Phone Interview: Provides Incomplete information	Phone Interview: Tells the truth.
Respect	Doesn't introduce him/herself. Doesn't address the patient (parent) by name (last name). Doesn't take into account patient's decisions,	Makes introductions. Addresses patient/relative by name. Takes team members into account.

	needs or desires.	
Empathy	Phone Interview: Insensitive provision of information	Phone Interview: delivers information sensitively.
Compassion	Phone Interview: Doesn't respond to alleviate relative's situation.	Phone Interview: Responds to relative's situation in a helpful / therapeutic way.
Ethics	Continues resuscitation	Recognizes and responds to DNR directives. Stops resuscitation
Disclose	Doesn't express regret Doesn't use structured disclosure approach	Expresses regret Follows structured disclosure (CMPA guidelines, SPIKES)
Health Advocate	Doesn't recognize medical error. Doesn't identify or respond to medical directives. Doesn't contact the relative.	Crisis: Identifies errors (bad resuscitation technique) Identifies patient's desires and needs. Responds to DNR directives.
Scholar	Doesn't use resuscitation guidelines. Does not correct resuscitation technique.	Crisis: Corrects bad resuscitation technique by teaching team members. Use current CPR guidelines "CAB" Appropriate use of CPR guidelines as reminders

Communication barriers: sitting behind the desk, far away or turned away and distracted.

Inappropriate gestures: bland expression, yawning, frowning, shifting, avoiding eye contact.

Respect: is the recognition of the unconditional value of patients as persons. Such respect involves respecting the autonomy of patients.

Empathy: is the ability to understand the patient's situation, perspective, and feelings and to communicate back that understanding.

Compassion: is the sympathetic consciousness of others' distress with a desire to alleviate it. Act on understanding patient's situation, perspective and feelings in a helpful (therapeutic) way.

These rules aren't a guide to specific scores, more they are *score limiters* – presence of the example behaviour prohibits scoring *higher* than the column in which it appears (if it's columns 2 or 3). If the example behaviour is in columns 4 or 6, presence of that behaviour means candidate score *at least* that score.

MEDICAL EXPERT

Competency	3 Marginal	4 Acceptable
Situation Awareness	Initial assessment appropriate. Fails to reassess situation as it evolves.	Frequently scans the environment including monitors. Anticipates likely events.
Medical history	Limited information gathering: chart and/or nurse; incomplete.	Gathers information from the patient (include medical alerts, cloths and purse) and other sources (relative, nurse, RT, chart, etc); fairly complete
Examine the patient and equipment	Obtains vital signs from nurse; minimal examination of patient.	Examine for responsiveness, pupils, respiration, vital signs and auscultate, medic alerts, clothes.
Diagnosis and differentials	Considers only the main diagnosis	Considers differential diagnosis looking for the cause: 5 Hs and 5Ts.
Confirmation and investigation	Only considers monitors	Orders blood work: CBC, ABG, electrolytes, cardiac enzymes, glucose.
Medical therapeutics	No or wrong medications given	Epinephrine 1 mg IV (1 dose)
Procedure therapeutics	Doesn't correct compression rate or depth.	Corrects CPR technique according to current guidelines CAB: chest compressions hard and fast, 30:2 compressions : respirations until intubation.
Deals with changing situations	Does not recognize response to treatment, nor considers alternative diagnosis or DNR.	Recognizes non-response to treatment, considers other causes (5Hs, 5Ts) and stops resuscitation once DNR order is confirmed with I.D. card.

APPENDIX 12. Raters' Rules for the morphine overdose Scenario

“These descriptors are intended to guide the distinction between borderline candidates. If candidates display behaviours in the 3 (Marginal) column, they do not necessarily score 3; they just *cannot score higher than 3*. If the candidate displays the behaviours in the 4 (Acceptable) column, they do not necessarily get a score of 4, they just *cannot score lower than 4*. Please try to use the full range of the scale”.

Competency	3 Marginal	4 Acceptable
Communicator Verbal and Non-verbal	Crisis: Doesn't use closed loop technique Disclosure: Speaks fast, uses jargon, doesn't confirm understanding, uses barriers and inappropriate gestures	Crisis: Clear, concise, close loop technique, shares and exchanges information, think aloud, listen team. Disclosure: Speaks slowly and clearly. Doesn't use jargon, checks for understanding, appropriate non-verbal communication. (Sits down. Eye contact, appropriate body language).
Collaborator	Crisis: loss of control. Doesn't demonstrate authority and leadership. Performs multiple tasks without delegating.	Crisis: Calm and control. Authority and leadership. Delegates tasks effectively Asks team members' for information (nurse, RT). Requests consults (ICU?) Post crisis (disclosure): Informs other members of the team about patient's condition (MRP, staff anesthesiologist).
Manager	Doesn't prioritize management of the emergency and gather information to solve the case.	Plans in advance. Appropriate utilization of key resources. Plans the disclosure meeting.
Professional Honesty	Disclosure: Provides Incomplete information	Disclosure: Tells the truth.
Respect	Doesn't introduce him/herself. Doesn't address the patient (parent) by name (last name). Doesn't take into account patient's decisions,	Makes introductions. Addresses patient/relative by name. Takes team members into account.

	needs or desires.	
Empathy	Disclosure: Insensitive provision of information	Disclosure: delivers information sensitively.
Compassion	Disclosure: Doesn't respond to alleviate relative's situation.	Disclosure: Responds to relative's situation in a helpful / therapeutic way.
Disclose	Doesn't express regret Doesn't use structured disclosure approach	Expresses regret Follows structured disclosure (CMPA guidelines, SPIKES)
Health Advocate	Doesn't recognize medical error. Doesn't identify or respond to medical directives. Doesn't contact the relative.	Crisis: Identifies errors (medication error, morphine overdose) Identifies patient's needs: continue analgesic treatment with modifications. Disclosure: Contacts the relative
Scholar	Doesn't use preprinted orders to guide treatment. Doesn't follow disclosure guidelines.	Crisis: Uses pre-printed orders to guide the treatment: Naloxone 2 mcg/kg dose q 2 min, can repeat x 4 until patient improves. Appropriate use of disclosure guidelines as reminders

Communication barriers: sitting behind the desk, far away or turned away and distracted.

Inappropriate gestures: bland expression, yawning, frowning, shifting, avoiding eye contact.

Respect: is the recognition of the unconditional value of patients as persons. Such respect involves respecting the autonomy of patients.

Empathy: is the ability to understand the patient's situation, perspective, and feelings and to communicate back that understanding.

Compassion: is the sympathetic consciousness of others' distress with a desire to alleviate it. Act on understanding patient's situation, perspective and feelings in a helpful (therapeutic) way.

These rules aren't a guide to specific scores, more they are *score limiters* – presence of the example behaviour prohibits scoring *higher* than the column in which it appears (if it's columns 2 or 3). If the example behaviour is in columns 4 or 6, presence of that behaviour means candidate score *at least* that score.

MEDICAL EXPERT

Competency	3 Marginal	4 Acceptable
Situation Awareness	Initial assessment appropriate. Fails to reassess situation as it evolves.	Frequently scans the environment including monitors. Anticipates likely events.
Medical history	Limited information gathering: chart and/or nurse; incomplete.	Gathers information from the patient (and other sources (relative, nurse, RT, chart, etc); fairly complete
Examine the patient and equipment	Obtains vital signs from nurse; minimal examination of patient.	Examine for responsiveness, pupils, respiration, vital signs and auscultate, medic alerts, clothes, extremities.
Diagnosis and differentials	Considers only the main diagnosis	Considers differential diagnosis looking for the cause: 5 Hs and 5Ts.
Confirmation and investigation	Only considers monitors	Orders blood work: CBC, ABG, electrolytes, glucose.
Medical therapeutics	No or wrong medications given	Naloxone 2 mcg/kg I.V. dose q 2 min can repeat x 4. Give fluid bolus
Procedure therapeutics	Does not suspend morphine infusion.	Suspend and disconnect morphine infusion. Maintains non invasive respiratory support.
Deals with changing situations	Does not recognize response to treatment, nor considers alternative diagnosis.	Recognizes response to treatment. Considers alternative analgesic management.