

Design and Development of an Escape Game as a Knowledge Transfer Tool in Preparation for an Accreditation Visit in a Health Care Facility

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ABSTRACT

Background: Knowledge transfer helps health care staff to be competent, well informed, and up to date. It also contributes to adherence to standards and best practices.

Objectives: To design, implement, and evaluate an escape game based on a selection of Accreditation Canada required organizational practices (ROPs).

Methods: This prospective descriptive study involved nurses and pharmacists in a health care centre. An escape game based on 6 ROPs was designed. The game was played by teams of participants in a patient room within the centre, with each game lasting 25 minutes. Participants' satisfaction with various aspects of their experience was assessed.

Results: A total of 200 people (52 teams) participated in the escape game. About half of the teams ($n = 28$) completed the game within the allotted time (average completion time 20 minutes, 53 seconds; standard deviation [SD] 2 minutes, 45 seconds). On average, 1.32 (SD 0.88) clues were provided to successful teams and 1.88 (SD 0.95) to unsuccessful teams. Participants were very satisfied with their experience. However, members of unsuccessful teams had significantly lower agreement that the escape game was relevant to their practice and that it was an effective method of communication.

Conclusions: An escape game based on a selection of ROPs was successfully implemented as part of the hospital's preparation for an accreditation visit. Use of an escape game as a knowledge transfer tool was appreciated by the staff.

Keywords: escape game, knowledge transfer, accreditation, medication use process

R SUM 

Contexte : La transmission des connaissances aide le personnel de la sant    tre comp tent, bien inform  et   jour. Elle contribue  galement au respect des normes et des meilleures pratiques.

Objectifs : Concevoir, mettre en  uvre et  valuer un jeu d' vasion bas  sur une s lection de pratiques organisationnelles requises (POR) d'Agr ment Canada.

M thodes : Des infirmiers et des pharmaciens d'un centre de sant   ont particip    cette  tude prospective descriptive. Un jeu d' vasion bas  sur 6 POR a  t  con u. Des  quipes de participants y ont jou  dans une chambre de patient au sein du centre, chaque partie durant 25 minutes. La satisfaction des participants   l' gard de divers aspects de leur exp rience a  t   valu e.

R sultats : Au total, 200 personnes (52  quipes) y ont particip . Environ la moiti  des  quipes ($n = 28$) ont termin  le jeu dans le temps imparti (temps moyen d'ach vement 20 minutes, 53 secondes ;  cart type [ET] 2 minutes, 45 secondes). En moyenne, 1,32 indice (ET 0,88) a  t  remis aux  quipes qui l'ont r ussi et 1,88 (ET 0,95) aux  quipes qui ont  chou . Les participants  taient tr s satisfaits de leur exp rience. Cependant, les membres des  quipes ayant  chou   taient significativement moins d'accord sur le fait que le jeu d' vasion  tait pertinent pour l'exercice de leur profession et qu'il s'agissait d'une m thode de communication efficace.

Conclusions : Un jeu d' vasion bas  sur une s lection de POR a  t  mis en place avec succ s dans le cadre de la pr paration de l'h pital   une visite d'agr ment. L'utilisation d'un jeu d' vasion comme outil de transmission des connaissances a  t  re ue de mani re positive par le personnel.

Mots-cl s : jeu d' vasion, transmission des connaissances, accr ditation, processus d'utilisation des m dicaments

INTRODUCTION

Knowledge transfer is "a process implemented to preserve, enhance and ensure the sharing of experience and knowledge acquired collectively in an organization" [authors' translation of definition from Office qu b cois de la langue fran aise].¹

In health care settings, knowledge transfer is essential for the safe delivery of care. It helps health care staff to be

competent, well informed, and up to date and also helps to ensure their activities align with current standards and best practices.

To encourage and verify the transfer and application of knowledge, hospitals may participate in an external accreditation process. In Canada, Accreditation Canada offers the QMentum program, which consists of about

100 standards as well as a series of required organizational practices (ROPs).^{2,3}

In Quebec, every hospital must be accredited by Accreditation Canada, the national accreditation organization, for the health and social services it provides. This accreditation is valid for a maximum period of 5 years, and hospitals must ensure that their accreditation is always up to date.⁴

Many strategies are available to support the transfer and application of knowledge, including use of an intranet, distribution of email messages and documents, presentation of information or training sessions, and organization of simulations and serious games (i.e., games “whose purpose is other than mere entertainment”⁵). Serious games include advertising games, “edutainment” games, creative games, informational games, error chambers, and escape games.⁶ An escape game is a game built around a specific scenario in which participants solve, collectively and within a limited time, a problem or a puzzle, typically to escape from an enclosed space. Such games can be real or virtual.⁷ After conducting a literature review on the use of escape games in health care settings,⁸ we hypothesized that an escape game could be useful in imparting knowledge related to Accreditation Canada ROPs during preparation for an accreditation visit in a health facility.

The main objective was to design, implement, and evaluate an escape game based on a selection of Accreditation Canada ROPs, as part of the preparation for a hospital accreditation visit.

METHODS

Study Design and Setting

This prospective descriptive study was conducted as part of a continuous improvement program for professional practices at CHU Sainte-Justine, a tertiary hospital in Montréal, Quebec, with 500 beds and a mother-and-child clientele.

Study Team

Our study team consisted of a pharmacy resident in internship (A.C.), an intern in quality management (A.D.), 2 pharmacists (S.A., J.F.B.), and the hospital’s director of quality, evaluation, performance, and ethics (G.P.). The study team had prior knowledge of and work experience in preparation for accreditation and quality of care.

Principles

To allow caregivers to participate in the escape game during working hours, we established the following criteria for the game’s design: the duration of each game had to be no more than 30 minutes; the equipment needed for the game had to be mobile, so that each iteration of the game could be set up close to the targeted care units; the setting of the game had

to re-create a patient’s room; and the accessories required to play the game had to be minimized, to facilitate set-up and initiation of each new iteration of the game.

Game Design

Our team began by signing up for a 60-minute commercial escape game, as a learning experience. The aim of the commercial game was to identify a murderer in a storyline with 3 rooms and many puzzles.

Next, the team identified the following 6 Accreditation Canada ROPs relating to the drug-use system as targets of knowledge transfer for the game that was being developed: client identification, medication reconciliation at transitions of care, high-alert medications, hand hygiene compliance, infusion pump safety, and disclosure of incidents affecting patient safety. The English wording of the ROPs is presented in this report, but the French versions were used when the game was designed. Clues relating to 2 other ROPs were added to the scenario (specifically, the “Do Not Use” list of abbreviations and information about concentrated electrolytes); these clues were not useful for success in the escape game but could still transmit some relevant knowledge.

During a subsequent brainstorming session, our team created a realistic scenario comprising 6 puzzles that involved a patient lying in a bed, with each puzzle having an associated padlock. The goal of the game was to figure out that the patient had had an allergic reaction to an antibiotic. The solution to each puzzle unlocked the associated padlock, revealing a clue for the next puzzle. Table 1 lists the 6 ROPs, the information that was sought for each ROP (the puzzle), and the actions required to identify the item being sought (to solve the puzzle).

Finally, our team prepared a written description of the scenario, specified the typical layout for the game (i.e., patient room with bed, bedside table, infusion pump, bulletin board, and computer), and purchased the accessories required (e.g., plush toy monkey [to represent the patient], blue wig [to represent the allergic reaction], posters).

The Game

The game took place in an unoccupied patient room near the work location of each targeted clinical team. Participants were greeted by a member of the research team and were blindfolded before entry into the room. Once the team of participants had entered the room, a 1-minute soundtrack was used to present the instructions. Upon removing their blindfolds, participants had to notice that the patient in the room had blue hair, and the objective was to find out what might explain this adverse event. Participants were given 25 minutes to solve the 6 puzzles and open the 6 padlocks. After 20 minutes, participants were given a 5-minute warning. A member of the research team remained in the room at all times and could provide clues (no maximum)

TABLE 1. Required Organizational Practices (ROPs), Associated Objectives, and Actions Required

ROP	Objective (Puzzle)	Actions Required to Solve the Puzzle
Client identification	Find the first name of the patient (not provided on identification bracelet)	<ul style="list-style-type: none"> Find the patient's hospital card among various cards available in the room (match photograph with patient) Correctly identify the patient using the hospital card and the patient's bracelet Find out the patient's first name Unlock the padlock using the first name
Medication reconciliation at care transitions	Identify discrepancies between the patient's medications taken at home and prescriptions written when the patient was admitted to hospital	<ul style="list-style-type: none"> Collect the patient's file containing the medication reconciliation report and the bag of medications taken at home Identify unintentional discrepancies between the medication reconciliation report and the admission prescriptions Unlock the padlock using the code
High-alert medications	Identify high-alert medications from among the selected drugs	<ul style="list-style-type: none"> Retrieve the drugs stored in the cabinet Sort drugs according to risk level (high risk and non-high risk) using the hospital's list Count the number of drugs of each type Unlock a video on the computer using the code obtained, based on correspondence between numbers and letters
Hand hygiene compliance	Identify the correct sequence of hand hygiene	<ul style="list-style-type: none"> Play the video on handwashing Order the various steps of handwashing Unlock the padlock using the code
Infusion pump safety	Identify the code on the pump (using ultraviolet light)	<ul style="list-style-type: none"> Retrieve the ultraviolet lamp from the drawer Look for the numbers written with invisible ink on the infusion pump Unlock the padlock using the code
Disclosure of patient safety incident	Identify the correct location on the AH-223 form ^a to document the adverse event	<ul style="list-style-type: none"> Retrieve the form Find the adverse event (allergy) that occurred using the clues present in the room (an allergy bracelet was hidden in the bed sheets, as if it had fallen off the patient's wrist; an order was written in the patient's file for the drug to which the patient is allergic; and that same drug was in the syringe placed in the infusion pump) Unlock the end-of-game video by typing the name of the checkbox on the form; the video presents the 6 ROPs discussed in the game

^aThe AH-223 form is an incident and accident report required by the Ministère de la santé et des services sociaux in the province of Quebec.

upon request. The research team member noted the number of clues given to each team. To add suspense to the activity, a generic soundtrack was played during the entire period of the game. At the end of the game, whether or not the team was successful, a video was shown on the computer screen reviewing the 6 ROPs targeted by the game, and the researcher answered participants' questions and distributed copies of the satisfaction survey.

Figure 1 illustrates the arrangements used for the escape game, and Figure 2 shows an example of the patient record to which participants had access.

Pilot Testing

To confirm the feasibility of the game, 5 groups of nurses and pharmacists (4 persons per group) were invited to participate in the game and provide comments on the scenario, the clarity of the instructions, and the puzzles. On the basis of feedback received, 19 alterations were made to the scenario (e.g., addition of posters to support the scenario, illustrating good hand hygiene and listing high-alert

medications; improvement of poster content; reformulation of certain clues; change in location of an accessory; correction of inaccuracies).

Study Participants

Study participants were recruited from the facility's health care staff. All clinical employees of the hospital were invited to form teams of 4 players, but teams of any size were accepted. Special efforts were made to recruit members of the nursing and pharmacy staff, and each team had to include at least 1 nurse. Each team had to register by phone or email to book a time to play the game. Time slots were offered mainly during the day, but some were booked in the evening or at night.

Recruitment

A communication plan was established for recruitment of participants, including promotion of the escape game in the hospital's newsletter and specific bulletins distributed to clinical teams, production of a trailer (the trailer,

in French, is available here: <https://www.youtube.com/watch?v=ZfWNEtICYx0&feature=youtu.be>), posting of announcements on bulletin boards, creation of a dedicated page on the hospital's intranet, distribution of email messages to team managers, and direct solicitation through clinical team leaders. To encourage participation, prizes (valued at \$100 each) were offered to the 3 teams with the fastest times to successfully complete the game, and there was also 1 participation draw.

Evaluation

To assess participant satisfaction, we developed a questionnaire consisting of 12 questions: 2 questions about the participants themselves (i.e., job title, clinical team), 1 question about prior participation in escape games, 1 question about participants' interest in escape games, and 8 questions about participation in this particular game (i.e., general assessment, organization of the activity, quality of the

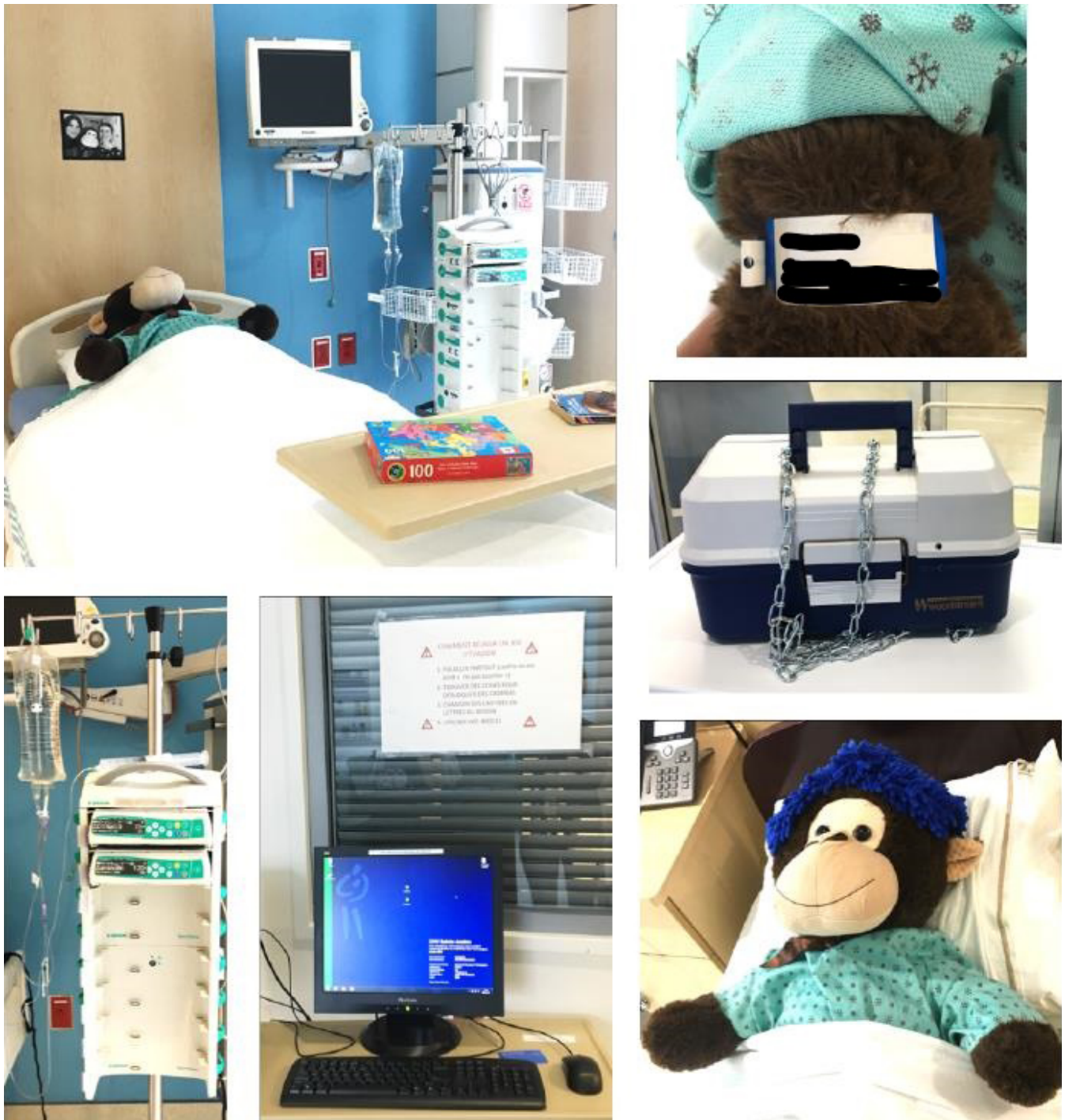


FIGURE 1. Set-up of the escape game.

activity, relevance of the activity, effectiveness of the activity in communicating information about the ROPs, impact on team communication, effectiveness of the advertising, and potential recommendation to colleagues to participate in the future). Responses for the last 8 questions were based on a 4-point Likert scale (strongly agree, partially agree, partially disagree, totally disagree).

The time spent on developing and managing the project was tracked, as were the expenses incurred.

Analysis Plan

The data collected were entered and analyzed in a spreadsheet (Excel, Microsoft Corporation). Satisfaction data were compared between participants who successfully completed the game and participants who did not solve all the puzzles. A χ^2 test was used to compare differences in proportions, with p values less than 0.05 being considered statistically significant.

Bilan Comparatif des Médicaments (BCM)

ORDONNANCES MÉDICALES

Aucune allergie connue (à cocher obligatoirement si applicable) : []

Allergias : Ampi

Intolérances : _____

Poids (kg): 30 Taille (cm): _____ Surf. corp. (m²): _____

Âge gestationnel (sem) : _____ Poids à la naissance (kg): _____

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Feuille d'ordonnance pré-rédigée (FOPR)
FOPRI – 1717 – Meilleur schéma thérapeutique possible – Ordonnances d'admission (1 de 2)

Sources de l'histoire médicamenteuse (minimum DEUX sources)

Patient/parents/tuteurs Médicaments (étiquettes, fioles, etc.) Liste personnelle

Dossier médical Liste d'établissement de santé Liste de pharmacie/DSQ (joindre au formulaire)

Autre (précisez): _____

Médicaments, produits de santé naturels et autres traitements pris lors des 2 dernières semaines
(incluant inhalateurs, gouttes oto-ophthalmiques, crèmes, gels, suppositoires, médicaments en vente libre, vitamines, probiotiques, suppléments, etc.)

Patient ne prend AUCUN médicament ou produit de santé naturel

Inscrire : Nom, dose, voie et posologie du médicament	Dernière prise :	Ordonnances de médicaments <small>Ces ordonnances ne sont valides qu'au CHU Sainte-Justine</small>
<u>Salbutamol 100 mcg, 2 inh q6h PRN</u>		<input checked="" type="checkbox"/> Continuer <input type="checkbox"/> Cesser <input type="checkbox"/> Modifier (précisez ↓)
<u>Beclomethasone 50 mcg, 1 inh BID</u>		<input checked="" type="checkbox"/> Continuer <input type="checkbox"/> Cesser <input type="checkbox"/> Modifier (précisez ↓)
<u>Prevacid fastab 30 mg PO DIE</u>		<input checked="" type="checkbox"/> Continuer <input type="checkbox"/> Cesser <input type="checkbox"/> Modifier (précisez ↓)
<u>Epival 250 mg PO BID</u>		<input checked="" type="checkbox"/> Continuer <input type="checkbox"/> Cesser <input type="checkbox"/> Modifier (précisez ↓)
<u>Topamax 100 mg PO BID</u>		<input checked="" type="checkbox"/> Continuer <input type="checkbox"/> Cesser <input type="checkbox"/> Modifier (précisez ↓)
		<input type="checkbox"/> Continuer <input type="checkbox"/> Cesser <input type="checkbox"/> Modifier (précisez ↓)
		<input type="checkbox"/> Continuer <input type="checkbox"/> Cesser <input type="checkbox"/> Modifier (précisez ↓)
		<input type="checkbox"/> Continuer <input type="checkbox"/> Cesser <input type="checkbox"/> Modifier (précisez ↓)

Révision par pharmacien demandée

Signature des personnes ayant procédé à la cueillette d'informations

Nom	Pernis	Date/heure
<u>Infirmière</u>		<u>23/01/2019 18h00</u>

Signature du médecin/professionnel autorisé à prescrire et no de permis

Date/heure : _____

Télécopié à la pharmacie par : _____ Date/heure : _____

#123456 médecin 23/01/2019 20:00

Ces ordonnances ne peuvent être exécutées qu'au département de pharmacie du CHU Ste-Justine. Les FOPRI sont disponibles sur INTRANET pharmacie.

FIGURE 2. Example of a patient record. For this clue, participants needed to correctly identify discrepancies and use the colored numbers to the right to unlock the padlock.

Ethics Review

The institutional review board of our centre confirmed that no ethics review was required for this quality improvement study, as per the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (2018).

RESULTS

The escape game was offered from February 20 to May 9, 2019. A total of 200 people (52 teams) participated in the escape game. It was estimated that the recruitment efforts reached 1050 people; the participation rate was therefore estimated at 19% (200/1050).

The teams consisted of 2 to 6 participants (mean 3.8, standard deviation [SD] 0.84). Nurses were the most frequent participants (76%, 152/200), followed by pharmacists (12%, 24/200) and those with other job titles (12%, 24/200), including administrative officers, orderlies, and managers.

The teams came from various departments in the hospital: pediatrics (31%, 16/52), hematology-oncology (23%, 12/52), maternity (21%, 11/52), intensive care (12%, 6/52), pharmacy (6%, 3/52), neonatology (4%, 2/52), and emergency (4%, 2/52).

Just over half of the teams (54%, 28/52) completed the game within the 25-minute time limit. Among these teams, the average time to complete the game was 20 minutes, 53 seconds (SD 2 minutes, 45 seconds).

The average number of clues provided was 1.32 (SD 0.88) for successful teams and 1.88 (SD 0.95) for unsuccessful teams.

All participants agreed to complete the evaluation questionnaire, and 196 of the 200 participants answered all of the questions. Overall, 113 of the 200 participants (57%) had played an escape game before participating in this game. Additionally, 178 (89%) of the participants indicated an

interest in games, including escape games. In general, most participants were very satisfied with their experience. For 4 of the 8 statements about perceptions of the game, there was no statistically significant difference in level of satisfaction between participants from teams that completed the game on time and those from teams that were unsuccessful. Relative to members of the successful teams, participants from teams that did not complete the game within the time limit had significantly lower agreement that the escape game was relevant to their practice and that the game was an effective way to communicate information about ROPs (Table 2).

The project required 148 person-hours of the study team's time: 62 person-hours to develop the game, 6 person-hours to develop and implement the communication plan, 30 person-hours to set up the room and the puzzles (for multiple iterations of the game), 36 person-hours to run the games, and 14 person-hours to manage the project. In addition to the cost of team members' time, expenses for the project were related to communication efforts (\$400) and accessories (\$200).

DISCUSSION

This study has demonstrated the feasibility of designing and presenting an escape game focused on knowledge of the medication-use system and the organizational practices required by a health accreditation body. To our knowledge, only one other escape game has been developed and described in the context of preparing for an accreditation visit.⁹

The concept of escape games dates to the early 2010s.¹⁰ In a literature review published in 2019, our team identified 16 publications (conference abstracts and articles) concerning escape games in the field of health care.⁸ There are still few data available on this subject.

TABLE 2. Participants' Satisfaction with the Escape Game

Statement	Success; % (n/N) Agreeing ^a with Statement		
	Successful	Unsuccessful	p Value
I enjoyed the escape game very much	96 (102/106)	84 (79/94)	0.003
I think the activity was very well organized	97 (103/106)	93 (87/94)	0.14
I think the activity was of very good quality	97 (103/106)	91 (86/94)	0.08
The escape game is relevant in the context of my duties	94 (99/105)	74 (68/92)	< 0.001
An escape game is an effective way to communicate ROPs	96 (101/105)	82 (75/91)	0.001
The escape game allowed me to work on team communication	95 (101/106)	90 (82/91)	0.09
Advertising around the game encouraged me to participate	78 (83/106)	71 (65/92)	0.22
I would recommend this game to my colleagues	97 (103/106)	83 (77/93)	0.001

ROP = required organizational practice.

^aAgreement based on the number who selected "strongly agree" or "partially agree" on the Likert-type scale.

Our escape game had similarities to other escape games that have been described in the literature. For example, it was intended for health care professionals and students¹¹⁻¹⁴ and was designed to improve participants' knowledge of a given topic^{11,15-17} and to develop teamwork and collaboration.^{18,19} However, our game did not include specific measurement tools to verify knowledge acquisition and retention. Only 2 other previously reported escape games have included a knowledge assessment.^{17,20}

Our game was, above all, intended to create a fun and satisfying learning environment, as was achieved by Nelson and others¹¹ and Kinio and others.¹⁴ As originally conceived, our rules of play targeted teams of 4 people, but we allowed teams of 2 to 6 players to participate, so that no volunteers were turned away. Teams of 2 to 6 players have been reported in previous studies, depending on the games developed.^{12-14,16,17,21,22} Larger numbers of players are generally not desirable, given the size of the game space and the number of concurrent activities to be performed by the participants. If there are too many players, participation and participant satisfaction could be compromised.

Although our team devised a detailed communications plan, including strategies such as a video to generate curiosity and interest, we found it relatively difficult to recruit participants. Our study took place in a university hospital, where it can be difficult to plan for health workers' participation in activities like this, given changing clinical activities and needs for patient care. Some participants were allowed to participate during their regular working hours, whereas others chose to participate in the game during their lunch breaks. Additionally, team managers varied in the extent to which they promoted this study among their staff. Nonetheless, we were pleased to have a total of 200 participants.

It can also be difficult to generate interest in activities related to accreditation visits. Typically, many actions must be taken to correct discrepancies noted during audits and self-assessment. In contrast, our escape game was designed in a fun way, without knowledge assessments before and after the game, to encourage participation and discussion. Some teams included managers, which may have led some participants to be more reserved about getting involved, because of the risk of highlighting their ignorance of certain ROPs. For the game to remain fun, it is important that participants feel they are on an equal footing with their teammates and that they feel united in striving to achieve a common goal.

Our study has highlighted the following conditions for success in the design and implementation of an escape game in a health care setting. First, the game should be as realistic as possible and should be pretested. Second, the game must be designed to ensure a high success rate, such that the majority of teams are able to succeed, to justify their effort and to reinforce the positive messages transmitted. In the evaluation survey for our game, a lower proportion

of participants who did not successfully complete the game within the available time rated the activity as relevant to their work compared with those who successfully completed the activity (74% versus 94%, $p < 0.001$). Third, the activity must remain confidential within the team, to allow participants to fully engage in the game without fear of being evaluated by a superior or a colleague outside the team. Fourth, the activity must be fun (including the presence of funny, surprising elements that stand out from everyday life). Fifth, the choice of facilitator is important because this person must be able to mobilize participants quickly, by giving clear instructions and offering pleasant feedback. Finally, a debriefing session may be useful, to ensure complete transfer of the shared knowledge.

We developed this game as part of our facility's training courses in pharmacy and risk and quality management. Thus, other than the time invested by students in their training, development costs were limited. Despite these limited costs, it is uncertain whether the results achieved are worth the effort required. In other words, could the 6 ROPs be taught to 200 people more efficiently, and could we have transmitted more knowledge during the 30-minute period of the game? Although the game was generally successful and the participants enjoyed the activity, we believe that other, traditional approaches would be more effective in imparting knowledge. However, participating in a fun activity was appreciated by staff and stood out in a stressful health care environment. Our study did not allow us to measure the indirect benefits on the work environment or the residual appreciation of participants in the weeks and months following the activity.

This study had some limitations. We did not conduct any debriefing after each iteration of the game, which could have helped to fill in knowledge that participants did not attain during the game and to answer questions and comments from participants. Thus, our escape game cannot be fully considered as a simulation tool but rather can be construed only as a serious game. Our study did not include a measure of knowledge retention over time. Although participants reported a high level of satisfaction, we could not verify whether the game actually improved their knowledge of ROPs. Doing so would have required measurement of their level of knowledge before and after the game. As mentioned previously, we believe that participation in such a game must be confidential, to ensure that participants express themselves freely and have fun during the activity. Any pre-and-post evaluation would require participant identification and loss of confidentiality.

CONCLUSION

As part of the preparation for a hospital accreditation visit, it was feasible to design, implement, and evaluate an escape game involving a selection of organizational practices

required by Accreditation Canada. The use of escape games is now a recognized knowledge transfer strategy and is appreciated by health care staff. More work is needed to confirm the impact of escape games on the acquisition and retention of shared knowledge.

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