

# Definitions and indexing of ‘simulated patient’ studies in health: a classification system proposal

Fernanda S. Tonin<sup>1,2</sup>, Isabela Pina<sup>1</sup>, Roberto Pontarolo<sup>3</sup>, Fernando Fernandez-Llimos<sup>4,5</sup>

1. Pharmaceutical Sciences Postgraduate Research Program, Federal University of Paraná, Curitiba, Brazil  
 2. H&TRC - Health & Technology Research Center, ESTeSL - Escola Superior de Tecnologia da Saúde, Instituto Politécnico de Lisboa, Lisbon, Portugal  
 3. Department of Pharmacy, Federal University of Paraná, Curitiba, Brazil  
 4. CINTESIS – Center for Health Technology and Services Research, University of Porto, Porto – Portugal  
 5. Laboratory of Pharmacology, Faculty of Pharmacy, University of Porto, Porto – Portugal

## Introduction and aims

Several inconsistencies on the definition and indexing of the pharmaceutical services terms have been reported in the literature (1,2). We aimed to propose a classification system for studies on ‘simulated patient’ and to assess the coverage of ‘simulated patient’ in the National Library of Medicine’s (NLM) Medical Subject Headings (MeSH) thesaurus.

## Methods

This was a cross-sectional study. A systematic search using combinations of synonymous of ‘simulated’ and ‘patient’ was performed (MEDLINE, Oct-2019) to identify all potential terms used to describe these studies. Records presenting at least one MeSH term, with an available abstract and referring to a study within the scope of health were included.

## Methods

A flowchart (Figure 1a) on the different methods of patient simulation was created; 5 categories were proposed: ‘machine/automation’ (no interaction between humans and patients); ‘audit’ (inspects the service or providers’ behavior; participants are not aware of the simulation); ‘assessment’ (evaluates the clinical skills/competencies of students or health professionals; participants are aware of the simulation); ‘education’ (educates students or health professionals; participants are aware of the simulation); and ‘others’ (secondary studies). Studies were classified in at least one category. Additionally, 7 MeSH terms were identified: ‘Simulation Training’ (affiliated terms: ‘High fidelity simulation training’ and ‘Patient simulation’), ‘Computer simulation’ (affiliated terms: ‘Patient-Specific Modeling’ and ‘Virtual reality’) and ‘Virtual reality exposure therapy’ (no affiliated terms) (Figure 1b). Exploratory analyses on articles’ allocation and accuracy parameters were calculated.

## Results

We retrieved 9,451 registers, of which 2,238 were excluded due the absence of an abstract or MeSH, and other 2,683 were considered irrelevant during screening. The remaining 4,530 studies were classified into: ‘assessment’ (n=1159, 25.6%), ‘education’ (n=491, 10.8%), ‘audit’ (n=441, 9.7%), ‘education and assessment’ (n=364, 8.0%), ‘machine/automation’ (n=316, 7.0%) categories (Figure 1c). The ‘machine/automation’ category included studies using an automaton (computer, mathematical model, virtual system) for simulating a human (virtual models of kinetics/dynamics of drugs, computational circuits on therapeutic effect). Most studies on ‘audit’ evaluated the performance of healthcare services (31.1%) or the behavior of physicians/residents (29.3%) or pharmacists (27.7%). Most studies classified as ‘assessment’ were designed to measure the skills or performance (e.g., comprehension, problem resolution) of medical students/residents (75.3%). In the ‘education’ category, studies were mostly represented by humans as simulated patients (49.5%), followed by dummies (23.4%); they targeted medical students/residents (51.1%), nurses (18.5%) and pharmacists (7.1%). The overall accuracy for all MeSH terms was 70% (sensitivity: 55%, specificity 93%) (Table 1).

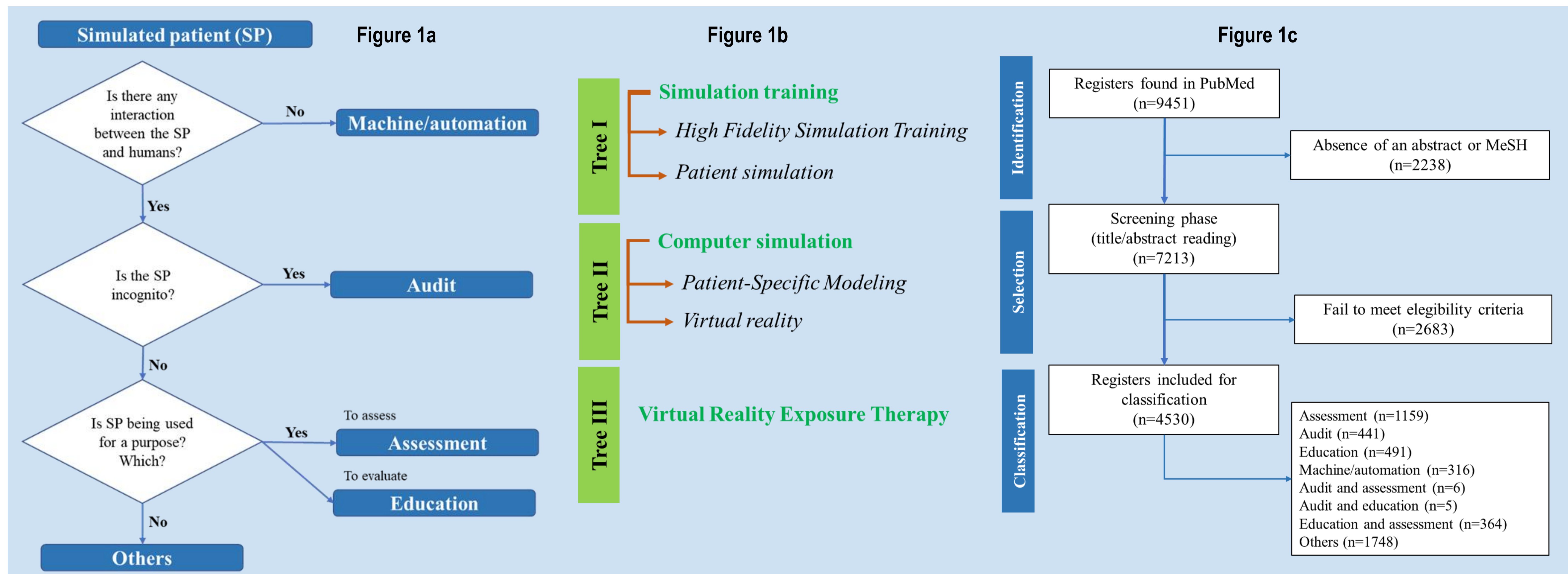


Figure 1a. Flowchart of the proposed categories for studies on ‘simulated patient’

Figure 1b. Overall hierarchy of the MeSH terms

Figure 1c. Flowchart of studies’ selection and classification

## Conclusions

The number of publications using ‘simulated patient’ significantly increased in the past years. Yet, around half of studies are not indexed with one of the currently available MeSH terms. The lack of standard definitions for these types of simulations may hinder the retrieval of relevant studies.

## References

- Gernant SA, Bacci JL, Upton C, et al. Three opportunities for standardization: A literature review of the variation among pharmacists’ patient care services terminology. Res Social Adm Pharm. 2020;16(6):766-75
- Fernandez-Llimos F, Salgado TM. Standardization of pharmacy practice terminology and the Medical Subject Headings (MeSH). Res Social Adm Pharm. 2021;17(4):819-20

Table 1. MeSH allocation in the evaluated studies (n=4530): accuracy data

Category	MeSH term	Sensibility	Specificity	Accuracy
Machine/ Automation	All terms	54.1%	63.5%	63.1%
	Simulation training	5.1%	70.7%	
	Patient simulation	4.1%	75.1%	
	High Fidelity Simulation Training	0%	99.5%	
	Computer Simulation	50.0%	90.7%	
	Patient-Specific Modeling	<1%	99.8%	
	Virtual reality	<1%	99.5%	
Audit	Virtual reality Exposure Therapy	0%	99.9%	60.1%
	All terms	33.9%	62.5%	
	Simulation training	33.4%	95.1%	
	Patient simulation	33.4%	76.7%	
	High Fidelity Simulation Training	0%	99.7%	
	Computer Simulation	<1%	88.2%	
	Patient-Specific Modeling	0%	99.8%	
Assessment	Virtual reality	0%	99.5%	62.5%
	Virtual reality Exposure Therapy	0%	99.9%	
	All terms	49.4%	65.1%	
	Simulation training	44.7%	76.2%	
	Patient simulation	39.5%	80.3%	
	High Fidelity Simulation Training	<1%	99.7%	
	Computer Simulation	6.9%	88.8%	
Education	Patient-Specific Modeling	<1%	99.8%	72.9%
	Virtual reality	<1%	99.5%	
	Virtual reality Exposure Therapy	<1%	99.9%	
	All terms	64.2%	66.4%	
	Simulation training	54.8%	75.4%	
	Patient simulation	44.4%	78.9%	
	High Fidelity Simulation Training	1.7%	99.8%	
Computer Simulation	12.7%	88.1%		
Patient-Specific Modeling	<1%	99.9%		
Virtual reality	<1%	99.5%		
Virtual reality Exposure Therapy	<1%	99.9%		

## Contact details

stumpf.tonin@ufpr.br  
 fernanda.tonin@estesl.ipl.pt

