

## **“Am I also going to die, doctor?” A systematic review of the impact of in-hospital patients witnessing a resuscitation of another patient**

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## Abstract

### Background

There is a growing interest on the impact of family witnessed resuscitation. However, evidence about the effect of hospitalized patients witnessing other patient's resuscitation is limited.

### Aim

The aim of this systematic review is to explore the existing evidence related to the impact on patients who witness resuscitation attempts on other patients in hospital settings.

### Methods

Databases BNI, CINAHL, EMBASE, MEDLINE and PsycINFO were searched with the terms: *patient, inpatient, resuscitation, CPR, cardiopulmonary resuscitation* and *witness*. Search strategy excluded the terms *out-of-hospital, family* or *relative*. Inclusion criteria were studies related to patients exposed to a resuscitation attempt performed on another patient; quantitative and qualitative design; physiological or psychological outcome measures. No limitations of date, language or settings were applied.

### Results

Five of the 540 identified studies were included; two observational studies with control group and three qualitative studies with interviews and focus groups. Articles were published between 1968-2006, and were mostly rated low quality of evidence. Quantitative results of the observational studies showed an increased heart rate in the study group witnessing a resuscitation ( $p=0.05$ ), increased systolic blood pressure ( $p<0.01$ ) and increased anxiety ( $p<0.01$ ). The qualitative studies highlighted several coping strategies adopted by exposed patients in response to witnessing resuscitation including denial and dissociation.

## **Conclusions**

Our findings suggest that patients may find witnessing resuscitation a stressful experience.

However, the evidence is sparse, mainly of poor quality. Further research is needed to better understand the impact of patients witnessing a resuscitation of another patient and to identify effective support systems.

## **Keywords**

Hospital; Patients; Emergency Treatment; Trauma and Stressor Related Disorders;

Resuscitation

## Introduction

The National Cardiac Arrest Audit 2014 documented that 22,628 adult patients in UK hospitals received cardiopulmonary resuscitation (CPR), defined as the receipt of chest compressions and/or defibrillation.<sup>1</sup> Overall, the incidence of in-hospital cardiac arrests is 1.6 per 1000 hospital admissions resulting in a high number of in-patients who might potentially witness resuscitation on other in-patients.<sup>1</sup>

Admission to hospital is considered a stressful experience for patients.<sup>2-6</sup> Stress has been shown to have a significant impact on how patients perceive their hospital experience and is greatly influenced by the environment in which they are nursed.<sup>7</sup> Patients admitted to hospitals face many changes leading to potentially stressful responses. On admission, the “person” takes the role of “patient”, and while receiving medical treatment and nursing care, the sense of identity and privacy are violated.<sup>8</sup> Anxiety can also be increased by separation from the family<sup>9, 10</sup> and by medical and surgical procedures.<sup>8</sup> Moreover, wards in most European hospitals are organized into bays<sup>11</sup>, which usually accommodate two to six patients, exposing their vulnerability to stressors related to peer-patients. Emergency interventions and invasive procedures performed on other in-patients such as CPR are typical examples of stressors that may be encountered.

CPR attempts are stressful events<sup>12</sup> where the life of a patient is at risk. This may be partially because outcomes of survival after CPR procedures are highly overestimated by lay public<sup>13, 14</sup>, also due to the skewed images of CPR given by television fiction.<sup>15</sup> These expectations are likely to influence both patients’ perception of their own survival<sup>15</sup> and lay public’s and first responders’ perceptions of CPR success in real life. Lay people attempting CPR face a traumatizing experience, difficult to deal with on psychological level.<sup>15</sup> There is evidence to suggest unrealistic expectations of CPR outcomes may generate extra

psychological burden, especially if the resuscitative attempt fails.<sup>16</sup> Despite this, the current literature on witnessed resuscitation focuses mainly on the presence of family members during CPR.

Witnessed resuscitation by family members is a debatable and controversial phenomenon which first received attention in the literature over two decades ago.<sup>17</sup> Nowadays, allowing family members to witness CPR of their beloved ones is gaining momentum across clinical settings.<sup>18-21</sup> Although the evidence base of family witnessed CPR is growing and providing knowledge to best practices, limited evidence is available in supporting patients witnessing other patient's CPR. Therefore, the aim of this systematic review is to examine the existing evidence concerning the impact on in-patients witnessing resuscitation carried out on a fellow patient.

## Methods

The systematic review is structured and reported according to the PRISMA guidelines (Electronic Supplement Material 1).<sup>22</sup>

### PICO & Eligibility criteria

Following the PICO (Population, Intervention, Comparison and Outcome), the review question was defined as: What is the impact (O) of in-patients (P) witnessing a resuscitation attempt of a fellow patient (I) compared to not witnessing a resuscitation of another patient (C)?

Criteria for inclusion were discussed and agreed in advance by the authors before the searches were conducted. Study population was limited to those describing in-patients

admitted to hospitals, while those describing the impact on family members, staff or out-of-hospital scenarios were excluded.

Due to the anticipated limited research in this area, outcome criteria were intentionally kept as broad as possible, to include any relevant published article. Therefore, outcome measures of impact, including both physiological and psychological factors, were considered for inclusion. No limits were set on study design, publication date or language.

### Information sources and search strategy

Searches to identify relevant literature were undertaken using the following databases: BNI (1992-February 2016), CINAHL (1981-February 2016), EMBASE (1980-February 2016), MEDLINE (1946-February 2016) and PsycINFO (1887-February 2016). MeSH terms and keywords included in the search strategy were: patient\*, inpatient\*, in patient\*, inpatients, witness\*, CPR, cardiopulmonary resuscitation, resuscitat\*, resuscitation (Electronic Supplement Material 2 Search strategy MEDLINE; the full search strategy of all databases is available from the authors). Terms relating to outcome measures were included in the initial search but resulted in limited number of papers. Therefore, search terms related to the impact of patients were excluded in the main search strategy on 9<sup>th</sup> of February 2016. Further relevant publications were identified through reference mapping of identified articles and discussion with experts. Additionally, Google Scholar was searched including keywords from the search strategy and forward citation of the included articles was performed.

### Study selection, data collection process, and data items

Two independent authors (MF,FL) screened all titles and abstracts identified in the search strategy considering their eligibility for inclusion. Any discrepancies were discussed with the third author (JML). Potentially relevant papers were read in full to determine eligibility based

on the inclusion and exclusion criteria. Data items of the included studies were defined as: study aim, design, sample size, population characteristics and settings, outcome measures and main findings.

### Strength of evidence and risk of bias assessment

In order to determine the quality of the selected studies and to address the reliability of recommendations for future research and clinical practice, selected studies were assessed for strength of evidence and risk of bias. The quantitative studies were assessed using the Cochrane GRADE system.<sup>23</sup> The GRADE approach rates quality of evidence on four categories, from very low to high quality, depending on study design and characteristics. Quality of evidence can be upgraded or downgraded based on the presence of certain limitations. Factors that may decrease or increase quality of evidence are: study design, (in)directness of evidence, (in)consistency of results, (im)precision of results, and publication bias. Qualitative studies were assessed through the hierarchy of evidence scale as proposed by Daly et al.<sup>24</sup> In this scale, studies are divided into four categories based on their design, limitations and evidence given for practice. From the strongest (level I) to the weakest (level IV), these categories are: generalizable studies, conceptual studies, descriptive studies and single case studies. The authors reviewed the included studies to determine the quality of evidence, with disagreements resolved by discussion.

### Synthesis of results

The selected studies were grouped by study design: quantitative and qualitative research methods. Further structured synthesis of the quantitative studies was not possible because the identified studies used heterogeneous outcome measures. Synthesis of the qualitative studies



was performed by reviewing the identified themes and sub-themes and identifying any overarching themes.

## Results

### Study selection

In total, 862 records were identified from the initial search strategy (Fig. 1). A further eight records were identified from Google Scholar, forward citation and reference mapping. After removing 330 duplicates, 540 articles were screened by title and abstract. Of these, 530 articles were not relevant. The full-texts of the 10 remaining articles were reviewed and five articles were excluded. Reasons for exclusion were: nurse's personal reflection about patients witnessing CPR, other non-CPR procedures, the needs of patients in a Coronary Care Unit (CCU) and two examples of witnessing CPR scenarios not describing analytical data.<sup>25-29</sup> Ultimately, five articles were included in the analysis (Fig. 1).<sup>30-34</sup>

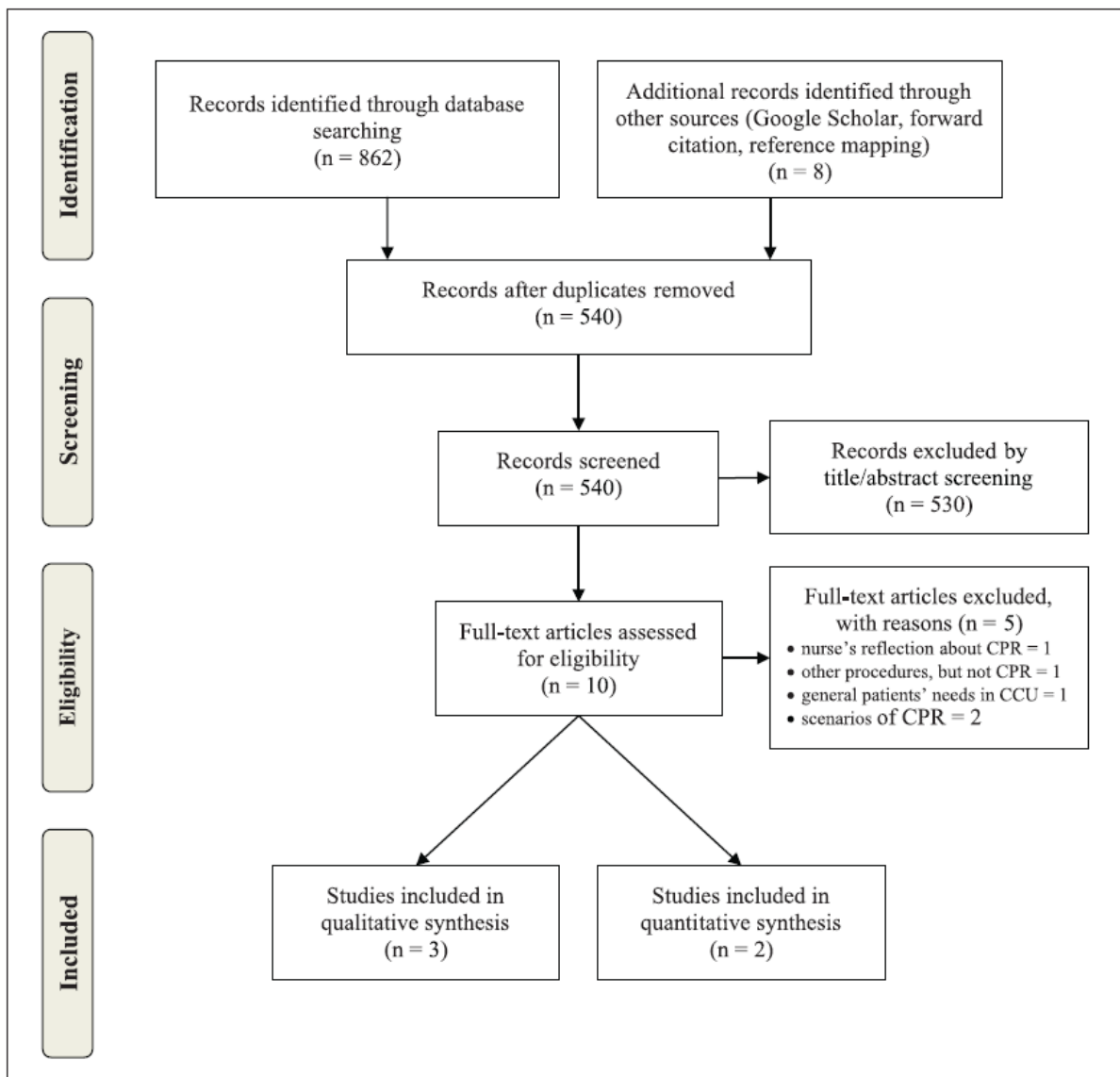


Figure 1. PRISMA Flow Diagram

CCU: coronary care unit; CPR: cardiopulmonary resuscitation

### Study characteristics

Of the five studies identified, two were observational studies with control groups<sup>31, 33</sup> and three studies used a qualitative design using interviews, observations and focus groups.<sup>30, 32, 34</sup>

Sample sizes ranged between 25 and 50 participants. One article did not specify the sample size, addressing only the number of events witnessed.<sup>30</sup>

Three studies recruited patients from CCUs with both single and multiple-bedded rooms. One study recruited patients from two cardiac wards and rehabilitation and one study was performed in a cardiac rehabilitation centre. The study characteristics and main findings are presented in Table 1.

**Table 1.** Summary of findings

Author(s) & Year	Aims	Study Design	Sample Size	Setting	Number of CPR events	Methods	Outcome Measure(s)	Findings
Badger, 1994	To describe psychological impact of witnessing a medical emergency	Qualitative, interviews and observations	Sample not specified. CPR carried out on 12 patients and between 6-9 patients per CPR event were interviewed	Outpatient cardiac rehabilitation department	12 CPR events, all successful	Inductive analysis of patients interviews, observations and field notes over five years (1989-1993)	Not applicable	Three themes: Attributional searching Mastery Disassociation
Bruhn et al, 1969	To identify physiological and psychological responses of patients who witnessed deaths	Observational study with control group	29 patients total: Study group: n=17 (witnessed a death after CPR) Control group: n=12 (no critical events witnessed)	CCU	Number not specified, all CPR events unsuccessful	Marsh's method analysis comparing differences between groups	1. Systolic blood pressure (SBP) and heart rate (HR)  2. Mood scored on a 4 point scale	1. SBP and HR: within study group, higher SBP (p<0.01) and HR (p<0.05) after witnessing a death (day 1) than on day 3. Between groups, higher SBP (p<0.05) in study group than control group on day 1. 2. Mood: increase in anxiety (p<0.01) in Study Group vs Control group after 24h
Hackett et al, 1968	To examine causes of stress to patients, including witnessing CPR	Qualitative, interviews and review of patients' charts	50 patients interviewed, of which 11 patients witnessed CPR	CCU	Number not specified, all CPR events unsuccessful	Interviews, review of charts/notes. Analysis method not reported	Not applicable	10 themes of CCU stay, including a theme 'Witnessing Cardiac Arrest' with sub-themes: denied fear; admitted fear; irritability and annoyance, astonishment (team efficiency), empathy, dissociation, reassurance
Isaksen & Gjengedal, 2006	To explore the significance of fellow patients for	Qualitative, focus group	25 patients, of which 1 witnessed CPR	Cardiac units and rehabilitation groups	2 CPR events, unsuccessful	5 focus groups. Data Analysis: independent open coding; cluster of	Not applicable	4 main categories, including 'disturbances', with the sub-category: dramatic events.

	patients with MI					codes; main and sub categories.		
Sczekalla, 1973	To measure variations on heart rate of patients exposed to resuscitation procedures on other patients	Multi-centre observational study with control group	37 patients total: Study group: n=25 Hospital A: n=13 Hospital B: n=12 Control group: Hospital B: n=12	CCUs in two hospitals	Number and outcome of CPR events not specified	Comparison of HR: 1. Within the study group at baseline and after exposure 2. Between study and control group	HR measures: Study group: last routine HR prior exposure; at CPR onset, then every 15 min; after 4 hrs. Control group: 4 hourly from 8AM to 8PM	Increased HR 4hrs after baseline for both study groups (hospital A and B). Increased HR 4hrs after baseline between study group and control group (p=0.05) In study group (hospital A) two patients arrested after exposure to CPR

CCU=Coronary Care Unit; CPR=Cardiopulmonary Resuscitation; HR=Heart Rate; SBP=Systolic Blood Pressure; MI=Myocardial Infarction

## Strength of evidence

Considering the quality appraisal of the studies, the two quantitative papers<sup>31, 33</sup> were rated as level IV, the lowest quality (Table 2). Both were observational studies, using indirect measures of outcome and at high risk of bias affecting the findings (due to lack of randomisation, allocation concealment and lack of blinding or correction for loss-to follow up).

**Table 2.** GRADE quality assessment of included quantitative studies

Study	Design	Limitations	Inconsistency	Indirectness	Imprecision	Publication bias	Quality of Evidence
Bruhn et al, 1969	observational	Serious Limitation	No serious inconsistency	Some uncertainty about directness	Sparse data	Undetected	⊕○○○
Sczekalla 1973	observational	Serious Limitation	No serious inconsistency	Some uncertainty about directness	Sparse data	Undetected	⊕○○○

⊕⊕⊕⊕ High: randomised trials or double upgraded observational studies

⊕⊕⊕○ Moderate: downgraded randomised trials or upgraded observational studies

⊕⊕○○ Low: double downgraded randomised trials or observational studies

⊕○○○ Very Low: triple-downgraded randomised trials or downgraded observational studies or case series/reports

Among the qualitative studies, two were descriptive studies and were both rated as level III. The articles described limited qualitative analysis methods and the findings were not transferable. One article was a conceptual study, rated level II, describing a theoretical framework based on conceptual analysis (Table 3).

**Table 3.** Quality assessment of included qualitative studies

Study	Features	Limitations	Evidence for Practice	Overall Level Given
Badger, 1994	<b>Level III</b> Purposeful sampling of individuals experiencing the phenomenon under study, from a selected group and setting with no further diversification	<b>Level III</b> The study describes anecdotal observations of participants and their experience. Data saturation not mentioned	<b>Level II</b> Not generalizable findings. Need further research on other groups. Evidence for practice and suggestions for interventions	<b>Level III</b>
Hackett et al, 1968	<b>Level III</b> Sample selected to illustrate practical rather than theoretical issues. Limited information about used methods	<b>Level IV</b> Applicability to other scenarios not considered. Data saturation not mentioned	<b>Level III</b> Identifies a phenomenon and issues for further consideration	<b>Level III</b>
Isaksen & Gjengedal, 2006	<b>Level II</b> Sample selected on theoretical concepts, based on analysis of literature. Conceptual analysis recognizes diversity in participants' views.	<b>Level II</b> Theoretical concepts that emerge during analysis do not lead to further sampling.	<b>Level II</b> Provides good evidence and residual uncertainties are clearly identified	<b>Level II</b>

Level I: generalizable studies; Level II: conceptual studies; Level III: descriptive studies; Level IV: single case study

## Outcome measures

The selected studies used a variety of outcome measures including: heart rate<sup>31,33</sup>, systolic blood pressure<sup>31</sup>, mood<sup>31</sup>, and recurring themes raised by patients<sup>30,32,34</sup> regarding the experience of witnessing resuscitation.

None of the studies used validated instruments to assess the impact of witnessing resuscitation. Bruhn et al.<sup>31</sup> and Szczekalla<sup>33</sup> used physiological measures as indirect approximations of stress. Bruhn et al.<sup>31</sup> also measured aspects of mood including anxiety, depression, hostility, anger and fear, using a non-validated 4 points scale (0=absent; 1=mildly present; 2=moderately present; 3=markedly present) based on subjective observations by the head nurse. The qualitative studies focused mainly on exploring recurrent themes, as is usual with qualitative studies, rather than measuring an *a priori* defined outcome.<sup>30,32,34</sup>

Follow-up periods were either not stated<sup>30, 32-34</sup>, or carried out at three days after exposure<sup>31</sup>, with no justification given in any case. Given the variety of outcomes measures used, it was not possible to pool data for analysis.

## Synthesis of results

In three studies, CPR procedures witnessed by patients were unsuccessful.<sup>31, 32, 34</sup> Patients with myocardial infarction in CCUs were continuously monitored on ECG and most of them were on sedative drugs<sup>33</sup>, or had continuous IV therapy, urethral catheter and vital signs were recorded hourly, at least.<sup>32</sup> Hackett et al. did not provide other details of continuous monitoring or medications of the participants.<sup>32</sup> No details about patients' medical condition in CCU, continuous monitoring or level of sedation were provided in Bruhn's study.<sup>31</sup> Isaksen and Gjengedal only specified that participants from cardiac units and rehabilitation groups had myocardial infarction in the last five years, but no further details were provided.<sup>34</sup> Differently, patients from the cardiac rehabilitation program had a variety of cardiac conditions and they witnessed different medical emergency on fellow patients, all of them followed by successful CPR procedures. In this case, patients' vital signs were recorded before exercise and several times during the workout and some patients were on telemetry monitoring. No further details were given about medications.<sup>30</sup>

Among the quantitative studies, Sczekalla's study reported a significant increase in heart rate in patients witnessing resuscitation attempts, when compared to those not exposed ( $p=0.05$ ), four hours after the exposure than at baseline.<sup>33</sup> No significant difference was reported regarding the variation of heart rate within exposed patients, in different environmental settings (Hospitals A and B).



Bruhn et al.<sup>31</sup> reported no significant change in heart rate between the study group and control group, although blood pressure was significantly increased ( $p < 0.05$ ) in the study group at day one. These patients also experienced significantly higher blood pressure ( $p < 0.01$ ) and heart rate ( $p = 0.05$ ) between day one and day three. Additional outcome measures included aspects of patient's mood such as anxiety, depression, hostility, anger and fear. The study group reported an increased anxiety 24 hours after witnessing a death after CPR compared to the control group ( $p < 0.001$ ) but no significant increase was reported in depression, hostility, anger and fear.

With regard to the three qualitative studies, two used interviews and other data collection techniques such as review of patients' charts, anecdotal observations and field notes<sup>30, 32</sup>, one used focus groups.<sup>34</sup> The study conducted by Badger<sup>30</sup> found patients adopted a range of strategies to cope with witnessing a cardiac arrest in a rehabilitation setting. The first psychological response reported by study participants appeared to be shock, disbelief and denial, shown by the lack of any outward expressions of fear or panic and a general calm demeanour. Following inductive analysis of the qualitative data, three cognitive themes were identified: attributional searching (trying to find a cause for the arrest), mastery (hypervigilance regarding rehabilitation and medications) and dissociation from the patient affected (restoring self-esteem through self-enhancing evaluations). Similarly, Hackett and colleagues<sup>32</sup> found that most of the patients witnessing a cardiac arrest denied fear either during or after the arrest and none of the patients identified himself with the patient affected. Other themes unique to this article were the annoyance and irritation expressed towards those undergoing resuscitation, rapidly followed by astonishment at the efficiency of the arrest team, and reassurance by the arrest drill, as the patient felt safer after witnessing the CPR attempt. In Isaksen and Gjengedal's study<sup>34</sup>, only one participant in the five focus groups witnessed two unsuccessful resuscitation attempts of another patient. This experience was

coded under the theme “disturbances” and sub-category “dramatic events”. The participant’s narrative was described as a chaotic situation, where, even if a folding screen was pulled, the patient could still hear everything.

In summary, these results suggest that witnessing CPR on another patient may represent a stressful experience, both physiologically and psychologically. Physiological stress factors were indicated by increased heart rate and blood pressure. The identified psychological stress experiences were related to anxiety, fear, disturbance and patients might adopt various coping strategies to respond to these stressful stimuli.

## Discussion

This review aimed to determine the impact of patients witnessing CPR on a fellow patient through a systematic review of the existing literature with only five articles meeting the inclusion criteria. The limited evidence suggests that patients experience physiological stress response while witnessing CPR, such as increased heart rate and blood pressure. The psychological burden of patients is demonstrated by emotions such as anxiety and disturbance, and by adopting a range of coping strategies. The most common strategies were described as dissociation from the affected patient and denial.

Some excluded studies focused on patients witnessing non-CPR procedures. For example, Vanson et al. documented that patients in an open bay who witness invasive procedures such as a Swan-Ganz catheter insertion, temporary trans-venous pacemaker insertion, had a higher pulse rate ( $p < 0.001$ ) than patients nursed in glass-enclosed individual rooms.<sup>27</sup> These results suggest that exposure to emergency procedures being performed on other patients is considered stressful and the environment in which the patients are hospitalised may influence their stress levels.

In the past decades, the concept of a “healing environment” has gained attention, emphasising the patient's physical and psychological comfort on healing and satisfaction.<sup>35, 36</sup> Following this concept, hospital architecture and configuration of patients rooms are changing worldwide. In the UK, the NHS has advised that at least 50% of all patients beds should be in single rooms in new hospitals.<sup>11, 37</sup> Patients in single rooms have reported significantly more satisfaction than patients in multi-bed rooms, especially in relation to quality of care, privacy, and dignity.<sup>38-40</sup> One study compared the impact of multiple and single rooms on patients in CCUs.<sup>41</sup> Results showed that multi-bedded units provided more social contact, while the single-bedded units provided more privacy and protection from witnessing other patients in distress. However, there was no evidence that quiet and protective single rooms reduced anxiety levels.<sup>41</sup> Based on case scenarios, Eshel et al. recommended to place the sickest patients in single rooms to prevent witnessed emergency procedures by other patients.<sup>29</sup> However, stronger evidence is needed to hypothesise that single rooms prevent avoidable stress stimuli among in-hospital patients.

There is also evidence to suggest that while some patients may find that the presence of roommates provides comforting social support<sup>3</sup>, other studies indicate that a roommate, especially when seriously ill, is considered a source of stress for hospitalized patients.<sup>42-44</sup> Consequently, witnessing a traumatic event regarding another patient may exacerbate this stress condition, with negative effects on patients’ long-term outcomes. In such cases, support has been highlighted as an important issue, providing reassurance, listening and therapeutic touch.<sup>26</sup> Badger proposed a three phases nursing support strategy for patients including: 1) Comprehensive nursing assessment and construction of a good relationship with the patient (pre-event phase); 2) Providing factual information about events and honest answers to peer patients’ questions (crisis phase); 3) Organizing group meetings explaining what happened

and anticipating medical outcome, with guidance if patient is suspected not to survive (post-event phase).<sup>30</sup>

Witnessing resuscitation may also lead to stress responses in volunteer lay-responders.<sup>45</sup> A recent qualitative study has shown that providing out-of-hospital CPR is emotionally challenging for lay-rescuers.<sup>46</sup> Among 20 interviewed lay-rescuers, the main themes were related to concern, uncertainty and coping strategies. Most rescuers experienced emotional responses having flashbacks and nightmares lasting from days to months. All study participants found it beneficial to discuss their experiences with family and friends while some required professional counselling.<sup>46</sup> Studies support the importance of debriefing lay-rescuers to help them to cope with emotional reactions after performing out-of-hospital CPR.<sup>12, 47, 48</sup>

To date, literature on witnessed CPR has mainly focused on family presence during CPR and support for family members. Two European studies documented that UK critical care and cardiovascular nurses were more positive in supporting the presence of family members during CPR than non-UK nurses.<sup>49, 50</sup> Axelsson et al. also found that cardiovascular nurses have concerns about family presence and uncertainties about the benefits for family members. Despite this, nurses strongly believe that support to the family should be provided by a designated team member with appropriate qualification.<sup>50</sup> Both studies recognised the lack of local protocols to regulate family-witnessed CPR in Europe.<sup>49, 50</sup> Chen et al. recommended the implementation of family-witnessed CPR policies in Taiwanese regional hospitals, demonstrating that family-witnessed CPR is gaining attention in Asian countries.<sup>51</sup> From a patient perspective, a qualitative study highlighted that successfully resuscitated patients were supportive to having their family members witnessing their CPR, for the emotional support and the advocacy of the family.<sup>52</sup> A recent cross-sectional study confirmed

these results. About 50% of the participants wished to have family members during their CPR, not only for support but also to ensure that the team is providing the best care.<sup>53</sup> Moreover, participants would like to express their preference about family presence and family members with formal consent on admission, as also confirmed by Albarran et al.<sup>53, 54</sup> In the case of family members, a recent qualitative study found that the choice to be present or not during a relative's CPR seems to help in alleviating the pain of a death, through the feeling of having helped to support the patient during that important moment.<sup>55</sup>

Finally, evidence showed growing interest on the public's perspectives regarding family presence during CPR. Medical television series play a major role in the transmission of medical information and can influence the public's perceptions about what happens in hospitals.<sup>56</sup> From the analysis of two medical dramas series, it seems that family presence during CPR is not portrayed as recommended by guidelines.<sup>56</sup> Ong et al. compared the attitudes of the public and medical staff.<sup>57</sup> The public was more positive to family presence during CPR than staff, believing this would help in the grieving process, while staff believed that relatives would have a traumatic experience.<sup>57</sup> Mazer et al. found that almost half of the public in a random telephone survey preferred to be present during CPR on a loved one and reversely desired to have family present if undergoing CPR themselves.<sup>58</sup> Although evidence exists regarding the perceptions of family witnessed CPR by the public, patients, family, and healthcare professionals, the topic of witnessed resuscitation by other patients remains unexplored. While some suggestions to improve supportive strategies to patients who witnessed CPR have been described, limited evidence-based recommendations are available.<sup>43, 59</sup> This includes advice for healthcare staff providing support to those patients. The 2015 European Resuscitation Guidelines do not provide guidance regarding supportive strategies to in-patients witnessing CPR of other patients while hospitalized.<sup>60</sup> Therefore,

further robust research is needed to address clinical practice about supporting patients who witness other patients' resuscitation.

## Limitations

The main limitation of this review was the low quality and low number of the included studies. Overall, these studies were methodologically flawed, greatly limiting the strength of any conclusion that can be drawn. Furthermore, most papers included in this review are outdated, with three of them published before 1975. Therefore, we were not able to clearly define the scope of impact of patients witnessing CPR on other patients, limiting our ability to define evidence-based recommendations for clinical practice.

## Conclusion

The findings of this review provided limited evidence of the impact of patients witnessing other patients' resuscitation in hospital settings. The findings suggest that patients may experience witnessing resuscitation stressful. This review highlights a gap in the current knowledge of supporting in-patients experiencing CPR of another patient. Therefore, to overcome the knowledge and research gap, it is recommended to reconsider the paradigm of witnessed CPR and include a focus towards in-hospital fellow patients. Specifically, in-depth explorative studies are needed to determine the scope of impact of patients witnessing CPR on other patients, including the need for long-term follow-up care. It is hoped these studies would inform specific psychological support interventions to be implemented and tested in hospital settings. This will contribute to gain further insight into the impact of witnessed CPR and to inform future best practices.

### **Implications for practice**

- Nurses should be aware of the impact of patients witnessing cardiopulmonary resuscitation.
- Counselling to patients witnessing cardiopulmonary resuscitation should be offered.
- Patients witnessing cardiopulmonary resuscitation might need follow-up care.

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## Electronic Supplement Material 1

Section/topic	#	Checklist item	Reported on page #
<b>TITLE</b>			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	3
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4-5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	4-5
<b>METHODS</b>			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	n.a.
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	5
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5-6
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	6
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	6
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	6
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	6
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	6-7

Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	6-7
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., $I^2$ ) for each meta-analysis.	

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Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	7
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	n.a.
<b>RESULTS</b>			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	7
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	8
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	8
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	9
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	9
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	8
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	n.a.
<b>DISCUSSION</b>			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	11-13
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	13
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	13
<b>FUNDING</b>			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	1

*From:* Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

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## Electronic Supplement Material 2: Search strategy MEDLINE

Line	Database	Search Term	View Results
1	Medline	patient*.ti,ab	<a href="#">5002378</a>
2	Medline	inpatient*.ti,ab	<a href="#">72130</a>
3	Medline	"in patient*".ti,ab	<a href="#">1252971</a>
4	Medline	INPATIENTS/	<a href="#">14822</a>
5	Medline	1 OR 2 OR 3 OR 4	<a href="#">5023896</a>
6	Medline	witness*.ti,ab	<a href="#">17489</a>
7	Medline	cpr.ti,ab	<a href="#">8579</a>
8	Medline	"cardiopulmonary resuscitation".ti,ab	<a href="#">10145</a>
9	Medline	resuscitat*.ti,ab	<a href="#">47715</a>
10	Medline	CARDIOPULMONARY RESUSCITATION/ OR RESUSCITATION/	<a href="#">35364</a>
11	Medline	7 OR 8 OR 9 OR 10	<a href="#">62427</a>
12	Medline	5 AND 6 AND 11	<a href="#">933</a>
13	Medline	famil*.ti,ab	<a href="#">809308</a>
14	Medline	relative*.ti,ab	<a href="#">1059913</a>
15	Medline	FAMILY/	<a href="#">65014</a>
16	Medline	13 OR 14 OR 15	<a href="#">1826160</a>
17	Medline	12 NOT 16	<a href="#">780</a>
18	Medline	"out of hospital".ti,ab	<a href="#">6106</a>
19	Medline	17 NOT 18	<a href="#">290</a>