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Review Article

The use of simulation in medical student education on the topic of breaking bad news: A systematic review

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ABSTRACT

Background: Simulated patients (SPs) are widely used, but the most effective way of utilising them in undergraduate breaking bad news (BBN) medical education is unknown.
Objectives: To conduct a systematic review into SP's use in developing BBN skills in medical students.
Methods: 14 databases searched with the terms "Medical education", "Patient simulation", "Bad news". Data was systematically extracted, and thematic analysis undertaken.
Results: Of 2117 articles screened, 29 publications met the inclusion criteria. These demonstrated a variety of SP models, including actors as patients (65.5%), peers (7.0%), and cancer survivors (3.5%). with delivery at varying times in the curricula. SPs are uniformly reported as having positive impact, but there is a lack of high-quality evidence comparing the use of differing forms of training. There was some evidence that virtual SPs were as useful as in-person SPs.
Conclusions: SPs allow students to practise vital BBN communication skills without risking detriment to patient care. Despite the heterogeneity of ways in which SPs have been used, the benefits of different approaches and when and how these should be delivered remains unclear.
Practice implications: Further educational development and research is needed about the use of SPs to support undergraduate BBN communication skills development.

Contents

Abbreviations: BBN, Breaking bad news; SP, Simulated patient

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1. Introduction

Breaking bad news (BBN) is a complex and stressful task that forms a crucial element of clinical practice [1]. It can be described as the process of providing unwelcome information which may "adversely and seriously affects an individual's view of his or her future" [2]. In the UK, the Department of Health has emphasised that "the way in which healthcare professionals present bad news is an important factor in how it is received, understood and dealt with" [3].

BBN takes an emotional toll on patients, relatives and the doctors alike. Doctors may become hesitant to share bad news, to avoid the impact bad news has on the recipients and themselves [4]. Especially now, in the era of COVID-19, it is crucial that doctors are competent at BBN [5]. The process of BBN needs to be tailored to the individual needs of patients and their families in order to assess and adapt to the degree of distress the patient and family experience [6]. Those delivering bad news need to be able to reflect on previous experiences to judge the effectiveness of their approach. Junior doctors may have to deliver bad news from the very beginning of their career, with little time to gain essential experience beforehand, and hence it is a skill that needs to be developed as part of undergraduate medical education [7].

Fallowfield and Jenkins reported that experience gained through training courses, rather than clinical experience, improved objective changes in key communication skills for a minimum of 12 months [8]. Teaching sessions can be delivered through different strategies [9] and can adopt models specifically created to train students how to deliver bad news. Current literature details numerous ways to structure a BBN consultation [10–13], though the best practice regarding which model to use is unclear.

The use of simulated patients (SPs) is widely recommended in training BBN skills [14,15]. SPs can be described as a person who portrays a patient in a simulated learning environment, emulating a clinical encounter [16]. The use of SPs when practicing BBN allows learners to practice and receive feedback in a realistic, yet safe and controlled environment. Students may make mistakes without fear of causing distress to an actual patient and become familiar with the components encompassing BBN [17]. SP encounters for BBN have been reported to improve students' overall abilities in BBN [15,18]. However, there are recognised limitations to the use of SPs. Students may react differently knowing the patient is not real; either being hypervigilant due to the awareness of the simulation, or cavalier knowing no patient is at risk [19].

Evidence surrounding effective uses of SPs to deliver BBN training in undergraduate medical education is fragmented and varied. Qualitative systematic reviews provide a broad exploratory view of existing literature [20], providing an overview of current knowledge and highlighting areas currently under-explored. This thematic systematic review was undertaken to provide a comprehensive qualitative review of the evidence for the use of SPs and their effectiveness in the delivery of BBN training.

2. Methods and materials

This review was initiated in March 2020 and has been registered on PROSPERO (CRD42020188554). Given the heterogeneity of the relevant literature in terms of study design, the models of BBN training used within studies and how SPs are involved, the review undertook a qualitative approach to the synthesis of evidence [20–22].

We searched 14 databases with the search terms "Medical education", "Patient simulation", "Bad news", and their expanded terms, in order to identify as many articles as possible. These databases were: NHS Evidence, TRIP database, Cochrane Library, Pubmed/Medline, Embase, Web of Science, Scopus, ProQuest, GpPubMed, MedlinePlus, Science Direct, SpringerLink, Mendeley and Google Scholar.

Studies were included in the review if they:

- Included education of medical students only,
- Included the use of simulation practices for educational purposes,
- Included BBN as a component of the educational content,
- Were original research articles,
- Had full texts available for authors to review.

Studies not available in English, discussion pieces, and those that were deemed to have a poor quality or high bias were excluded. Studies were assessed for bias using the Cochrane Risk of Bias (RoB) 2 tool [23], and quality was assessed using appropriate STROBE checklists [24]. The cut-off for the RoB2 tool was four or above, with assessors discussing the inclusion of any study scoring three. The cut-off for STROBE was if a study had seven or more deficits, with inclusion discussions occurring for those scoring four or more.

Search results were compiled into Covidence [25] to allow for multiple reviewers to screen articles in a randomised order. Screening at each stage was performed by two blinded reviewers, referring to the inclusion and exclusion criteria. At the end of each screening stage, conflicts identified between the two reviewers were discussed and a consensus was met. A third senior reviewer was available to resolve any remaining conflicts; however this was not required.

Initially duplicates were removed, and titles and abstracts were screened for inclusion. Full texts were then assessed for eligibility, with exclusions categorised as wrong study design, wrong population studied, discussion piece, wrong interventions explored and full text not available. Where full texts were not available, authors were contacted requesting the full text.

The reference lists of accepted studies, prior to bias and quality screening, were screened in order to identify any additional relevant literature that may have been missed through our search strategy. After full text review, studies were assessed for risk of bias and quality, using the Cochrane RoB2 tool [23] and appropriate STROBE checklists [24] respectively.

The thematic analysis was done collaboratively at each stage, allowing for key themes and differences in opinions to be thoroughly explored. We adopted a 'bottom-up' qualitative approach that allowed a broad insight of the delivery of BBN training and the effectiveness SPs have in this setting. Themes began to form during the bias and quality checks, and initial data extraction. As studies were categorised within these, subthemes were developed. Literature within each subtheme was explored to define the premises within each subtheme. These were discussed by all authors. In order to

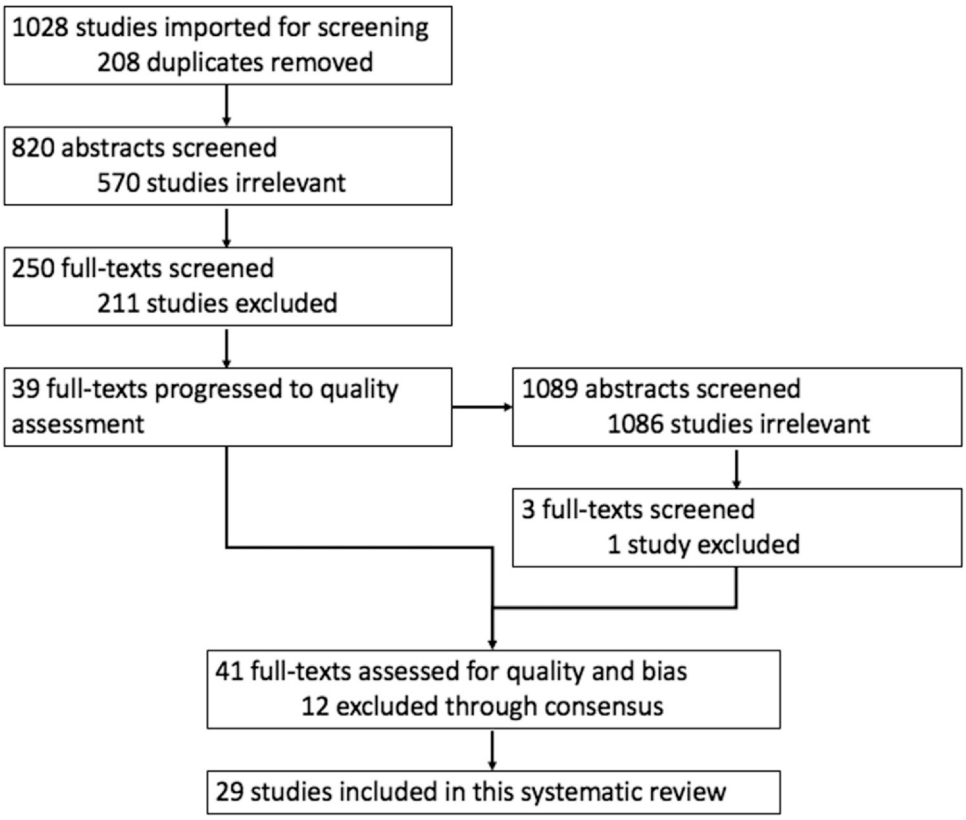

Fig. 1. PRISMA flow diagram, outlining each stage of study selection for this systematic review.

provide balance within each theme, the subthemes and were refined for clarity and coherence.

Our results section reflects the quality and bias of the papers included within each subtheme. Conclusions drawn from studies with better scores for bias and quality are given more weighting in comparison to those with poorer scores.

3. Results

Results of the search strategy can be seen in the PRISMA flow diagram (Fig. 1). Searches through the 14 databases resulted in 1028 studies. 208 were automatically removed as duplicates using the Covidence screening tool. Out of the 820 abstracts screened, 570 did not meet the inclusion criteria. 250 full texts were reviewed, with 211 studies excluded for the following reasons:

- Discussion piece (102, 48.3%)
- Ineligible study design (74, 35.1%)
- Ineligible population studied (19, 9.0%)
- Ineligible intervention (4, 1.9%)
- Full text not available (5, 2.4%)
- Duplicates identified (7, 3.3%)

From the reference lists of the 39 remaining studies, a further 1089 abstracts were screened, leading to three full-texts reviewed and two full-texts being included.

Following STROBE and ROB2 checks, 12 studies were excluded; 7/12 carried a high risk of bias, 5/12 were of poor quality, with issues around the availability of results for conclusions to be drawn. In total, 29 studies remained in the study for data extraction and qualitative review.

Table 1 and Table 2 respectively outline the studies that included qualitative (9/29), quantitative (26/29) and mixed-methods (6/29) data collection. Mixed-methods studies are featured in both tables.

Following the analytical approach to this thematic systematic review, iterative discussions regarding the subthemes and their context within the wider thematic review led to three main themes: Intrinsic components of BBN training within medical education, Outcomes measured within BBN literature, and Models used to structure BBN delivery. The subthemes identified within each theme are described in Table 3.

Out of the 29 publications, 14 (48.3%) were from Europe, 11 (37.9%) from the US, 1 from Pakistan and 3 publications did not specify. The number of participants in each study ranged from 10 to 1007, with a median (interquartile range) of 89 (41–244) students.

A variety of different types of SP were involved in the studies: 19 (65.5%) used actors, 2 (6.9%) used students, 1 (3.4%) used cancer survivors, 1 (3.4%) used theatre simulations (actors displaying an event, using a pre-set script), and 3 (10.3%) used more than one method. Torke [27] for example, used a theatre-based simulation for the students to watch, followed by SP role plays. Two studies were unclear as to the form the SP took.

3.1. Theme: intrinsic components of BBN training, within medical education

This theme explores how BBN training in structured and delivered within undergraduate curricula, including how the efficacy of these methods are assessed. Two subthemes were developed; the structure of BBN training in medical curricula, and how simulated patients are used in BBN education.

3.1.1. Subtheme: structure of BBN training in a medical education curriculum

Sixteen publications described how BBN training is structured in the curriculum [15,26–40], ranging from first year to final year, spanning both pre-clinical and clinical years. No studies directly investigated the most effective time for BBN education. There is a

Table 1
Quantitative studies included within this systematic review.

First author, date, country	Risk of Bias result	STROBE Quality result	Year group studied	Number of MS	BBN model used	Study design	Study aim (s)	Observations/ Intervention	Outcomes described
Baer 2008 US	0	5	2nd year MS	553	SPIKES	Pre-/post-test	Assess the use of cancer survivors as SPs for teaching BBN	Role play exercise followed by feedback	1. Use of cancer survivors as SPs in BBN scenarios is an effective teaching method
Berney 2017 Switzerland	3	6	4th year MS	236	NS	Randomised comparative study	Assess the impact of one to one feedback post SP vs small group training involving SP in teaching BBN	Video recordings of BBN sessions with SPs examined against Calgary-Cambridge checklist	1. Individualised teaching BBN has a better performance outcome vs small group training
Bonnaud-Antignac 2010 France	1	6	5th year MS	108	SPIKES	Pre-/post-session self-assessment	Assess a training course on disclosure of a diagnosis	Training course on BBN, with SP and assessor feedback	1. Improvement of students' feelings of competence 2. Students welcomed the practical approach
Bowyer 2010 US	1	6	3rd year MS	553	SPIKES	Randomised Control Trial	Assess and compare the use of pretraining scheme for teaching BBN	Different training programmes vs one control, preparing students to BBN to a SP	1. Watching a video detailing SPIKES immediately before BBN to SP was most effective
Brouwers 2018 The Netherlands	1	4	4th year MS	133	NS	Longitudinal survey study	Assess experiences of a longitudinal helical BBN training programme	Survey immediately after training, with follow up	1. Follow up data indicate students feel less competent than immediately following BBN training 2. Students require more feedback and emotional support during BBN training
Burn 2014 NS	2	1	3rd Year	164 – Pre 150 – Post 114 – Follow-up	NS	Longitudinal survey study	Observation of ethical attitudes, competence and comfort, and difficulties with BBN	90 mins course including: 15 mins- ethics discussion 60 mins practice of communication skills with SP	1. Students learned from training that patients may prefer different levels of information 2. Students became more comfortable with BBN with teaching, and more so with SP practice 3. Females felt less comfortable than males with BBN in clinical practice
Colletti 2001 US	4	9	3rd year MS	38	NS	Randomised Control Trial	Assess the effectiveness of BBN with SPs	SP-experienced MS vs MS with no experience	1. MS who previously experienced BBN with SPs performed better 2. Differences in previous BBN scenarios did not change performance
Deinzer 2019 Germany	3	0	2nd Year MS	86	NS	Observational cohort	Assess endocrine and psychological stress responses	Physiological changes between observer vs 'doctor' roles	1. Cortisol levels rose after self-observation, for 'doctor' role 2. Anxiety levels remain low during feedback
Fernandes 2019 US	2	7	4th year MS	123	NS	Self-reported questionnaire after teaching	Assess the use of SP in Team Based Learning	Team Based Learning session including SP interview, followed by group discussion	1. Students identified the application and practice of skills to be beneficial to learning
Fortin 2002 US	2	9	Course lasted 1st and 2nd year	91 in 1st year, 36 in 2nd year	NS	Longitudinal survey design	Evaluation of workshops using SP interactions	2 workshops in first and second year	-SP interview considered most valuable, will least preference for large group discussions
Hulsman 2010 The Netherlands	1	4	4th and 5th year MS	20	NS	Observational cohort	Explore psychological and physiological stress	Stress levels were measured in four situations: rest, reading aloud, history taking, and BBN.	1. Highest stress during BBN 2. Association between self-reported and measured stress response 3. Stress response from BBN still present during following consultations.

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Table 1 (*continued*)

First author, date, country	Risk of Bias result	STROBE Quality result	Year group studied	Number of MS	BBN model used	Study design	Study aim (s)	Observations/ Intervention	Outcomes described
Kiluk 2012 US	0	3	4th year MS	NS	SPIKES	Pre-/post-teaching questionnaires	Evaluate perceptions of the method used in teaching how to break bad news	Videotaped SP encounter, followed by group session and review of video with clinician	1. Consensus response that watching themselves and others back on video was beneficial 2. Discussion with the SP was identified as the most helpful component of teaching
Kron 2017 US	1	3	2nd year MS	421	SPIKES	Randomised Control Trial	Compare virtual reality to computer-based learning for communication skills training	Virtual reality learning, BBN delivery (vs control: computer learning)	1. Students trained through virtual reality performed better than computer learning 2. Students valued non-verbal skills feedback in virtual reality group
Luttenberger 2014 Germany	3	0	2nd Year MS	182	SPIKES	Self-reported questionnaires before and after	Evaluation of SP-based BBN training	10 role plays exploring communication skills	1. > 75% agree they learned important communication skills 2. Playing the 'doctor' role as an SP is more useful than patient role 3. Peer feedback was highly-rated as constructive and beneficial
Mortsiefer 2012 Germany	2	6	4th Year	85 (evaluation forms collected from BBN course)	SPIKES	Survey	Development and assessment a new interdisciplinary programme, aiming to teach communicative competence.	Preliminary teaching followed by group exercise involving a SP.	Overall positive response to BBN training
O'Rourke 2019 US	2	4	3rd year (12), 4th year (37), 5th year (11) MS	60	NS	Randomised comparative study	Evaluate real SP vs virtual SP	Comparison between new virtual SP and control real SP.	1. Interacting with both SP types were similarly emotionally arousing, defined by self-reported mood and salivary cortisol 2. Real SP scenario was rated as more authentic and realistic
Quest 2006 US	0	1	4th Year MS	35	Self-designed model	Observational cohort, pilot	Validity and reliability assessment of a new Competency Score, during BBN exercise with SP	Assessment of reliability and face/content validity of the Affective Competency Score	1. Tool is valid for use by staff, and SP, for assessing MS competency at BBN delivery 2. Tool is not appropriate for MS to assess competency with
Qureshi 2020 Pakistan	0	2	5th year MS	80	NS	Randomised Control Trial	Explore whether SP feedback improves communication skills	Assessment of communication skills assessed twice, with one group receiving feedback from SP after the first encounter	1. Feedback improved communication skills, though not in BBN 2. BBN was considered to be the most difficult component
Rosenbaum 2009 US	0	1	3rd year MS	2 consecutive year groups – 1999 (175), 2000 (165)	NS	Observational longitudinal study	Evaluate the impact of BBN training on MS comfort.	Self-reported confidence pre- and post-training	1. Training provided increased comfort with MS performing BBN tasks 2. 1 year follow up showed continued increase in confidence
Skye 2014 US	0	5	2nd year	451	NS	Survey	Assess interactive theatre, coupled with role play exercises involving professional actors, in exploring BBN.	20-minute sketch of BBN, followed by discussions between audience and actors.	1. Allows student to think about their own approach to BBN 2. Students perceive this was a valuable education experience

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Table 1 (*continued*)

First author, date, country	Risk of Bias result	STROBE Quality result	Year group studied	Number of MS	BBN model used	Study design	Study aim (s)	Observations/ Intervention	Outcomes described
Torke 2004 NS	1	3	3rd Year	60 – Pre 58 – Post (6-months)	Self-designed model	Pre/ post-test, survey	Evaluation of end-of-life curriculum	3-foci education: Theatre-based facilitated case discussion, with 2 SP role plays	1. Theatre case discussion enhances learning 2. Students agree curriculum was beneficial and prepares student for BBN immediately after course and on follow up
Van Dulmen 2007 The Netherlands	2	5	2nd Year MS	57	NS	Observational cohort study	Examine stress and its relationship with performance, during first-time simulated bad news delivery	Self-reported pre- and post-test stress. Pre- and post-test physiological measures	1. No relationships between the students' stress the quality of their communication 2. Positive association between immediate and lasting physiological stress measures and degree of patient-directed gaze 3. Anticipation of an assessment increases the cortisol response 4. Students were stronger with giving information, and were weaker with handling patient's emotions
van Weel-Baumgarten 2012 The Netherlands	1	0	MS after BBN training, and MS at end of degree	1007 – immediately after training 657 – end of degree	SPIKES, ABCDE	Observational, cross-sectional survey	Comparison of how students value BBN training across different schools	Comparison between two time-points of BBN understanding, using self-designed questionnaires	1. MS consider training to be appropriate immediately following training, though retrospectively consider training to be too early in their course. 2. MS reflect that they would have benefited from more guidance.
Vermylen 2019 US	3	2	4th Year MS	10	SPIKES	Pre-/ Post test	Evaluate the use of BBN assessment tool, developing a minimum passing standard benchmark.	15-point checklist to measure successful BBN 5-item scaled list to measure successful BBN	1. Pre-/Post-test use of checklist identifies significant differences in competency following standardised training 2. Minimum passing standards set at 12/15, and 4/5, for the checklists
von Lengerke 2011 Germany	0	0	2nd Year MS	267 – Pre 180 – Post	SPIKES	Pre-/post test	Evaluation of communication skill training course	Self-assessed competency	1. Statistically significant improvement of self-assessed competency of BBN skills
Wijen-Meijer 2015 Germany	0	3	3rd Year MS	42	NS	Observational cross-section	Comparison of vertical integrated and non-vertical integrated BBN training	Comparison of non-vertical integration (Groningen) with vertical integration (Utrecht), assessed by BBN with SP	1. Non-vertical integration students had higher scores than vertical integration students.

Risk of bias and STROBE columns refer to the number of domain-deficits each article had, relative to the tools used. SP: simulated patient, BBN: breaking bad news, MS: medical students, NS: not specified.

Table 2
Qualitative studies included within this systematic review.

First author, Date, Country	Risk of Bias	STROBE Quality	Year group studied	Number of MS	BBN model used	Study design	Study aim	Analytical method	Intervention	Key themes explored
Baer 2008 US	0	5	2nd year MS	553	SPIKES	Survey	Assess the use of cancer survivor SPs for the teaching of BBN	Narrative analysis	Student post course qualitative assessment	1. Students highly valued input from cancer survivor SP 2. Students valued panel discussion following roleplay
Carrard 2020 Switzerland	2	4	4th Year	23	NS	Focus group	Explore opportunities and limitations of virtual patient simulation in BBN education	Thematic analysis	Virtual patient simulation	1. MS found video self-observation beneficial 2. MS became more cognisant of verbal and non-verbal communication skills 3. Virtual patients need better interactivity and flow
Fernandes 2019 US	2	7	4th Year MS	123	NS	Survey	Assess the use of inclusion of SP in Team Based Learning	Thematic analysis	Team Based Learning SP interview, followed by group discussion	1. MS engaged better with learning opportunity, and value the opportunity to practice skills 2. Enhanced opportunity for feedback and discussion
Fortin 2002 US	2	9	Course lasted 1st and 2nd year	91 in 1st year, 36 in 2nd year	NS	Survey after each workshop	Evaluation of workshops using SP	Content analysis	2 workshops over 2 years	1. SPs contributed to learning by giving MS opportunities to experiment, critique, and analyse interviewing skills without harming real patients
Kron 2017 US	1	3	2nd year MS	421	SPIKES	Survey	Compare virtual reality to computer-based learning for communication skills training	Qualitative text analysis from reflective essays	Virtual reality learning, BBN delivery (vs control: computer learning)	1. Immediate feedback and engagement with video recordings 2. Preparation for and practicing BBN delivery 3. Clinical application of communication skills
Luttenberger2014 Germany	3	0	2nd Year MS	182	SPIKES	Survey	Evaluation of SP-based educational course	Frequency of categorised comments	10 role plays exploring communication skills	1. MS value diverse content-delivery 2. MS report learning useful skills for their future role as a doctor
Ruiz-Moral 2019 Spain	1	4	4th year MS	16	NS	Focus groups	Explore perceptions of MS about BBN training	Thematic analysis	Focus groups following education modules including the use of SPs	1. Students value use of SPs greater than theory components 2. Students prefer witnessing an example roleplay before performing their own with SP 3. Students value feedback discussion immediately following roleplay performances and observations
Skye 2014 US	0	5	2nd year MS	451	NS	Survey	Investigate use of interactive theatre, coupled with role play exercises involving professional actors, in exploring BBN and end-of-life issues	Thematic analysis	20-minute sketch of BBN, followed by discussions between audience and actors.	1. Enabled exploration of multiple perspectives 2. Theatre considered more realistic that SP roleplay 3. Provided overview of clinical case, not just BBN delivery 4. Theatre-based training is less effective at building confidence than role play with SP
Villagran 2010 NS	1	6	4th Year MS	21	SPIKES, COMFORT	Post-hoc interviews	Evaluate use of SPIKES, and create new model (COMFORT)	Latent content analysis	Video recorded BBN delivery sessions, using SPIKES, prior to interview	1. Communication, orientation, mindfulness, family, ongoing (communications), reiterative, and team-working.

Risk of bias and STROBE columns refer to the number of domain-deficits each article had, relative to the tools used. Key themes explored details the themes addressed within the article itself. SP: simulated patient, BBN: breaking bad news, MS: medical students, NS: not specified.

Table 3
Thematic map outlining the three themes identified through thematic analysis of the 29 studies included in this review.

Theme	Subtheme	Essence	Reference
Intrinsic components of BBN training, within medical education	Structure of BBN in a medical education curriculum	Although these encounters cannot replace actual patient interactions, this exercise provides a safe learning environment for the student. As a result, these students will have a solid background from which to begin the applied work of developing good communication skills	[29]
	How simulated patients are used in BBN education	Our students explicitly highlighted their preference for experiential learning as opposed to other teaching methods such as lectures, classes or even, as in our case, the more interactive demonstrative sessions.	[32]
Outcomes measured within BBN literature	Assessing competency developments throughout BBN training	Students who previously had the experience of breaking the bad news of a pregnancy loss or a new diagnosis of rectal cancer performed significantly better on the CPE (clinical performance examination) than students who had not had this experience	[15]
	Students perceptions and physiological changes during and after BBN training	Although this intervention does not report on actual skills, we were able to assess learners' levels of confidence and comfort in providing this information before and 1 month after the educational intervention.	[36]
Application and assessment of models used to structure BBN delivery	SPIKES: a widely adopted method to structure BBN delivery	The six steps of the SPIKES protocol: (1) setting up the interview; (2) assessing the patient's perception; (3) obtaining patient's invitation; (4) giving knowledge and information to the patient; (5) addressing patient's emotions with empathic response; and (6) strategy and summary	[29]
	Less accepted models to structure BBN delivery	The method for delivering a death disclosure was designed in a procedural style model with a series of critical actions.1 The steps included: (1) preparation, (2) introduction, (3) delivery of a warning of bad news, (4) say the word “dead”/“died,” (5) reaction tolerance, (6) information exchange, (7) offering of viewing, (8) conclusion, and (9) personal aftercare.	[50]
	Publications without clearly defined models for BBN delivery	Prior to the student's SPI encounter, he or she is also given a packet of materials explaining this particular SPI experience and also providing information on techniques for breaking bad news	[15]

Essence in this table outlines the fundamental principle of the subtheme, with a verbatim extract from the reference provided. SP: simulated patient.

suggestion that some medical schools provide BBN training too early, without longitudinal support for the clinical application of these complex communication skills [33,40]. Research in this field would benefit from a robust comparison between early, late and continuing delivery of BBN education.

Studies varied with how they approached delivering BBN skills training. Some provided theory prior to practical experiences, some with theory afterwards to consolidate knowledge. Many in this subtheme used only SPs [16,26–34,36–40], whereas some used additional methods such as group discussions [29,34,39,40], theatre scenarios [27,35], or team-based learning [28].

BBN fits into several components of the undergraduate medical curriculum. Many studies reported BBN being delivered within a communication skills module, whilst others held this training in more specialist areas including surgical clerkship [15] and team-based discussion modules [28]. They did not identify whether BBN was better suited to being in any specific year, or any specific module, and this is something that appears to need further research.

Most studies explored education within one cross-section, using non-vertical integrated (non-VI) teaching programmes. VI curricula integrate both clinical and fundamental science components throughout the course. Non-VI curricula predominantly begin with fundamental sciences and apply clinical components afterwards. One study comparing 30 VI curricula with 29 non-VI curricula identified that the students taught using the VI curricula performed better overall in clinical assessments, though their performance with BBN was significantly weaker [26]. This paper recommended others validate this difference further, to rule out this difference having occurred by chance.

Students reported in two studies [33,40] that they felt they needed additional educational support and guidance with regards to BBN in clinical practice, and those who received this reported how much this was valued. Educators training students on BBN skills might wish to consider incorporating further guidance or top-up skills training as a follow up.

3.1.2. Subtheme: how simulated patients are used in BBN education

Fourteen studies considered how SPs could be used in teaching BBN [14,15,27,28,30,33,35,38,41–46]. These identified that students appreciated diverse content delivery, whether from a scenario with multiple perspective with the use of theatre performances [27,35], acting as both the physician or patient [38], or using former patients [46] or externally-sourced SPs [14,15,27,28,32,41–43,45]. SPs were used both to provide new information by delivering teaching themselves to the students about their experiences, or by allowing students to explore new materials independently and putting these newly learned skills into practice using the SP as an educational tool. From this review no studies compared the various use of SP and the effect on test performance. This may provide the basis of important work to assess the effectiveness of varying forms of SPs in their use as educational resources for BBN skills training.

One study [43] reported that both virtual SPs (vSP), defined as “interactive computer simulations of real-life clinical scenarios” [47], and real SPs could both be used to help develop students' skillsets. A vSP is created for the purpose of delivering a consistent virtual experience that students can engage with. This can be used to more systematically represent diversity in healthcare than is feasible with real SPs whilst standardising the training across the student cohort. Kron [31] identified that the use of vSPs to actively encourage students to decide how to deliver bad news was significantly better (for both clinical assessment and independent communication scales) than students learning BBN skills through observation and theory alone [31].

The array of settings for the use of SPs included clinical and classroom, with and without recordings, educator-observers and peer-observers. No distinct comparators were made between the clinical and classroom settings.

Overall, students are receptive to the use of SPs, allowing for a safe environment for BBN without potentially causing detriment to patients [45]. One study reported that being observed whilst practising BBN skills, especially by peers, made some students

uncomfortable [32]. More literature investigating the comparative use of technology to deliver diverse, standardised and high-quality BBN training would provide significant educational value to medical courses.

3.2. Theme: outcomes measures for BBN training

This theme describes evidence related to outcome measures used to assess BBN training. It includes two subthemes that relate to competency and to the perceptions and physiological changes that occur throughout and following BBN training.

3.2.1. Subtheme: assessing competency developments throughout BBN training

This subtheme addresses the different approaches to assessing BBN competencies that are described in the literature. Seven studies included detailed methods on assessing competency development for BBN using SPs [15,29,30,32,39,41,43,48–50]. Competency was measured from a variety of markers, including external assessors [41,43,50], course staff [30,39,48], peers [43], or SPs themselves [15,43,48,50]. All made judgements on the students' ability to BBN whether that be through individual face to face feedback or through a numerical mark. One study began to create structured grading systems for BBN using SP, including 15/ 5-point checklists [30]. These will need further validation and rigorous testing before wider adoption in medical education settings.

Two publications discuss the natural talents students may have with BBN skills [32,48], with one suggesting that female students are more empathic and therefore better at BBN [48]. Such generalisations carry risks; however, it may be that some students are naturally more empathic, have previous experiences with BBN training or have personal experience of BBN that may affect their communication skills. One study identified a significant number of students with prior experiences [29], though all other studies in this subtheme failed to record previous experiences before their intervention.

In two publications [41,45], competency was assessed through students' own opinions alongside that of the assessors. Subjective appraisal is considered further in the next subtheme.

3.2.2. Subtheme: students' perceptions and physiological changes during and after BBN training

Eleven studies reported physiological changes during BBN sessions, as well as students' attitudes [27,29,32,36,37,41,42,45,51–53]. Seven studies identified that students' confidence improves with BBN skills training [27,29,36,37,41,45,52], with two of these findings being self-reported competence [37,45]. The sustainability of these changes was only investigated by one study which found that it was retained at 6 months [27], although it was unclear whether there had been opportunities to consolidate their learning during this period. A different study identified a significant improvement in confidence as a result of witnessing a doctor using BBN skills with an SP, in a clinical environment [29]. Witnessing BBN skills in the time between intervention and follow-up may reaffirmed or further develop students' knowledge base and may affect the results.

Three studies explored stress responses to BBN scenarios, including cortisol, anxiety, and cardiovascular measures [42,51,53]. Stress responses increase in anticipation to BBN scenarios or BBN examinations, and decrease after the scenario. An interesting point is that if BBN is first in a series of clinical examinations, students' stress levels remain higher throughout the remaining assessments, in comparison to those who started on a different scenario [51]. Whilst there is evidence to suggest that increased stress levels do not affect performance on BBN OSCE examinations [53], there is little evidence in our review to suggest this is the same for the subsequent examinations.

3.3. Theme: models used to structure BBN delivery

The studies included in this review included different methods of structuring BBN consultations. Three distinct subthemes were identified through thematic analysis; studies that had no model detailed in the methods, studies that incorporated SPIKES, and studies that used an alternative BBN consultation structure.

3.3.1. Subtheme: publications without clearly defined models for BBN delivery

There were sixteen studies that did not clearly define or use any evident model of structuring BBN [15,26,28,32,35,36,39–40,42–45,48,51–53]. Having a lack of structure makes it difficult to draw transferable learning from these studies.

In order to provide clear guidance for medical educators, comparisons between models and their effect is critical. Publications without specified models of BBN limit conclusions that can be drawn through meta-analysis. More research is needed to allow comparisons between BBN models, to help identify best practice.

3.3.2. Subtheme: SPIKES: a widely adopted method to structure BBN delivery

There were eleven publications that detailed use of the SPIKES protocol to structure BBN delivery in their research [11,14,29–31,33–34,37–38,41,46]. Baile and colleagues [10] initially identified four important objectives that clinicians need to achieve when delivering bad news. These were: gathering information from the patient, transmitting the medical information, providing support to the patient, and eliciting the patient's collaboration for developing a plan going forward. SPIKES, the 6-step model, builds on these points and forms the essence of our subtheme (Table 3).

SPIKES is the most widely adopted model for BBN, though in the absence of comparative studies it cannot be assumed to be the gold standard. Our review identified only one study that aimed to investigate the validity of SPIKES directly [11]. Further validations, and comparisons with other models, are needed to support its wider use.

3.3.3. Subtheme: alternative models to structure BBN delivery

Four publications detailed a different model for BBN [11,27,33,50].

COMFORT was developed in 2010, after judging SPIKES as being too linear [11]. An overarching set of competencies was proposed to deliver BBN in a more adaptive manner considering family and being able to reiterate points, which the authors deemed SPIKES does not allow for. However, no independent data emerged from the review detailing the efficacy of COMFORT compared to SPIKES.

ABCDE was developed in 1999 to act as a mnemonic for clinicians' recommendations for BBN in the available literature at the time [13]. This model was evaluated across multiple medical schools [33]. It was often used in combination with SPIKES, and its added value is unclear.

Two studies [27,50] produced new models of structuring BBN consultations, without explanation of their validation in the context to their study population. With the genesis of additional BBN models, without validation or with the aims to prove fault in existing models, educators may struggle to find identifying the most effective model for teaching BBN consultations. Research should focus on the validation of BBN models, including their pitfalls, to permit further refinements.

4. Discussion and conclusion

4.1. Discussion

This systematic review identified 29 studies that reported ways in which BBN training using SPs are applied across the

undergraduate medical curriculum. While SPs were reported as having positive effects on students' ability to deliver BBN, there was a lack of high-quality evidence comparing the use of differing forms of SPs in terms of the effectiveness and sustainability of BBN skills development. Given the heterogeneity of curricula and the ways in which SPs have been used to support BBN training, the benefits of different approaches, and when these should be delivered, remains unclear.

A range of SP models were described, including ex-patients, students, actors and computerised models. From the research that had compared SP and vSP approaches, they had similar effects in both performance and physiological response [31]. Making greater use of vSPs could provide benefits in terms of providing students with access to greater patient diversity and scenarios (i.e. not restricted to race, gender, age, ethnicity or disability), while also reducing medical school costs associated with the recruitment, training and administration of SPs. The use of vSPs may also provide a more consistent educational resource, avoiding the possibility of students receiving variable quality training from different actors as SPs. This may allow students to practice and consolidate on communication skills, including BBN, across a broad range of patients, at various points of the curriculum.

Several studies recognised that when developing programmes using SPs, teaching could be adapted to draw on students' past experiences. Previous experience, whether as a patient, family member or in a healthcare role, may mean that some students are more able to draw on knowledge and skills when BBN to a SP. The lack of consideration for students' baseline knowledge and experiences prior to their educational intervention, further limits conclusions that can be drawn about the effectiveness of the SPs for BBN training.

4.1.1. Assessment of BBN skills competency

None of the studies reviewed assessed students' competencies using validated measures, although one study reported the development of a structured objective grading system [30]. This may mean that some of the deeper nuances of BBN, such as the empathic connection and wider impact of the clinical encounter, are not assessed.

Some studies used self-assessment for judgement of competency. Subjective assessment of confidence and competence can be useful to support self-reflection but cannot be considered as an alternative to a formal assessment of BBN skills. Students are unlikely to be consistent in assessing their own BBN skills; for example, Burn's study [52] showed there was a difference in comfort in BBN between male and female students.

Torke identified there was continued confidence in BBN skills six months after the training [27]. This argues for the importance of BBN training close to completion of the medical degree, where it can be applied in a clinical environment post-qualification. A longitudinal study looking at the quality of skills and their longevity would provide much needed clarity.

4.1.2. Stress and stress responses to BBN

Students experienced increased and prolonged stress levels during BBN examinations in comparison to taking a medical history and other assessed scenarios [42,51,53]. This is an important consideration in the design of OSCE stations where BBN may be assessed first for some students and last for others. Alongside an examination setting, placement into an inappropriate simulated environment early on may place unnecessary anticipatory stress on students prior to their placement experience. This may have longer term impacts on students' abilities to learn and their overall health [54]. Students may benefit from additional support and reassurance during BBN training to ensure that the process of developing BBN skills avoids placing undue pressure on themselves.

Research into the relationship between assessment sequence, physiological levels and examination result would provide insight into whether performance is affected by the increased stress levels. This could help determine if adjustments are necessary for those who undertake BBN scenarios first, preventing results from being adversely affected by an examination sequence.

4.1.3. BBN consultation models used in medical education

The theme 'Models used to structure BBN delivery' explored the various models of consultation for BBN training. The data in this review indicates that SPIKES is the most widely adopted and robustly validated model for BBN skills training in undergraduate medical education. Other models exist and whilst they have face validity, they require additional work on their effectiveness compared to SPIKES before wider adoption can be recommended in both clinical training and practice.

However, over half of the studies in this review did not clearly narrate the use of a BBN model. Without clear and reproducible methods, the findings from studies lack reproducibility and wider applicability.

4.1.4. Strengths and limitations of this review

This work is the first review to explore the use of SPs to deliver BBN training in undergraduate medical education. We identified a broad literature with several formats for SPs. We undertook thorough review of the studies included, and our results are weighted to reflect the quality of the articles within each subtheme.

A limitation is that we only explored the use of BBN in undergraduate medical education, not after qualification. Other work has considered the use of SPs in BBN training with qualified doctors [12] or in multidisciplinary groups. While there may be implications from this wider body of literature for the development of undergraduate teaching, the purpose of our review was to describe what is known about how SPs are used to train BBN at an undergraduate level.

Another limitation is that the process of screening papers, or weighting the subthemes' narrative, using the RoB and STROBE bias and quality checks may have led to valuable information being overlooked in studies that have been screened out. Weighting of the subthemes in this work was done to reflect the quality of the papers in each section.

The review was also limited by the varied operational definitions across studies with regards to students' skill level and abilities, assessments of competencies, and the impact of the training. A key example is seen with the outcome measures available in literature. Two subthemes arose, identifying outcome measures varied across both academic assessments and perceptions/ physiological changes. Although positive effects were reported, in the absence of accepted validated measures for BBN training, such effectiveness can only be interpreted within the context of these studies. In order to derive firmer conclusions about the comparative effectiveness of different models of BBN training, the use of validated outcome measures is needed.

4.2. Conclusion

Our findings indicate that SPs are a valuable educational tool for developing BBN skills. They support the provision of training experiences in a safe setting, emulating clinical practice. The review highlights key gaps in the literature, and makes recommendations for future research and educational development. This includes the need to investigate the longer term sustainability of BBN skills after educational interventions, the time points in the undergraduate curriculum at which BBN skills training can be most effectively delivered, and distinctions between the effectiveness of different models of SPs. Such additions to the literature are needed to inform

the design and delivery of future undergraduate training to equip doctors with excellent breaking bad news skills and competencies.

4.3. Practice implications

Our review supports other recommendations about the importance of training around BBN [55,56]. Further work to identify the most effective SP models, as well as potentially progressing the work into exploring patient reported outcomes, would be valuable. The wider adoption of SPs to support training future doctors with BBN skills should lead to improvements in this important aspect of care.

There are several communities that may benefit from the results of this review. Teachers of BBN skills in undergraduate medical education might wish to consider structuring additional skills development, or top-up skills training, later in their curricula. Those assessing clinical skills may need to consider the impact of the increased stress and anxiety levels BBN examinations can cause, which may affect subsequent examination performance.

BBN skills have been taught at every stage of an undergraduate medical degree, with no clear evidence as to when it is most effective. There is also no formalised assessment structure for BBN, other than ensuring students use each point on an existing model, such as SPIKES. Researchers may wish to focus efforts on these two areas, to inform development of a more structured training programme.

The majority of studies in this review did not detail which consultation model was used in their work. Whilst SPIKES was the most widely adopted model in this review, there is little evidence comparing BBN models. Further research in this field would provide medical schools with the necessary evidence to determine how to train their students with a robust consultation model.

There is scope for further development beyond the standard face to face SP teaching method. Exploration of teaching methods including theatre performances, integration into team-based learning, and vSPs, alongside ongoing research into their efficacy, may lead to significant developments in the field of BBN skills.

CRediT authorship contribution statement

TDM, NL and JD designed the search strategy and protocol, TDM and NL performed the search, assessed for bias and quality, TDM and NL thematically analysed the literature, TDM, NL and JD drafted and commented on the written article.

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