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Review article

The 'Kidney' model for optimising feedback in undergraduate clinical communication: A meta-ethnographic systematic review

Katherine Miles [a,b], Bernadette O'Neill [b], Shuangyu Li [b,c,*]

[a] Department of Pharmacology, Public Health and Clinical Skills, Faculty of Medicine, Hashemite University, Zarqa, Jordan
[b] GKT School of Medical Education, Faculty of Life Sciences and Medicine, King's College London, London, UK
[c] King's Cultural Competency Unit, Faculty of Arts and Humanities, King's College London, UK

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ABSTRACT

Objectives: Feedback frameworks/models focus on certain aspects of the feedback process, but a coherent and systematic model is lacking. A meta-ethnography was conducted to identify and synthesise guidance for optimising feedback interactions in undergraduate clinical communication simulations.
Methods: A systematic search of 4 electronic databases and grey literature was conducted. Following Noblit and Hare's seven phases for conducting meta-ethnography, key themes and concepts were synthesised to provide new interpretations of components in effective feedback interactions.
Results: 373 publications were identified and 14 included for the final synthesis, which informed the development of a new Feedback Kidney Model. The Model illustrates the interconnections of various components that allow for effective feedback interactions. The main processes include preparation, proactivity, analysis and feedback information, reception and response, and influencing factors.
Conclusions: This meta-ethnography moves beyond providing an up-to-date synthesis of feedback guidance to proposing the brand-new Feedback Kidney Model, which can guide medical education and future research into how feedback is co-constructed and utilised to promote learning.
Practice implications: Clinical communication should incorporate meta-cognitive training and using this Model will help students better utilise on-site face-to-face feedback to enhance their learning and improve future communication with patients.

1. Introduction

Clinical communication teaching for medical students typically utilises experiential learning, including learner-patient consultation simulation [1]. Real-time feedback given by a tutor, simulated patient and peers to a learner who participated in the consultation simulation is an important component of the design of these experiential sessions. The aim of feedback is to reinforce good communicative practice and identify areas for development [2]. Effective feedback may lead to learners' changed communication behaviour and application of positive actions to improve their communication with patients in the future.

Traditionally, educational feedback was considered as a unidirectional flow of information from the tutor to the trainee, through which the feedback giver compares an observed performance to a standard, which will hopefully be adopted by the trainee for improvement [3]. More recently, Telio and colleagues [4] propose that feedback interactions be seen as an interactive and co-constructed event, involving all parties present [4]. This dialogic conceptualisation of feedback is pertinent to clinical communication teaching, where feedback is jointly negotiated and re-negotiated as each consultation scenario presents different communication possibilities [5]. There is originality and creativity in every communication encounter with an element of uncertainty [6] engendering a variety of good practices, rather than one objective standard for communication. This contrasts with other educational settings, such as foreign language classes, where there may be pre-determined learning outcomes and objective standards to measure performance against [7]. Furthermore, in other educational settings feedback interactions usually occur between an expert, such as a teacher, and a learner, but in clinical communication training there may be other people involved in the feedback interactions including peer learners and a (simulated) patient. This also distinguishes the feedback interaction in clinical communication from that in other educational

* Correspondence to: King's College London, 5.14 Virginia Woolf Building Strand Campus, 22 Kingsway, London WC2B 6LE, UK.
E-mail address: shuangyu.li@kcl.ac.uk (S. Li).

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settings.

Evolving pedagogical theories and practices have influenced the development of various feedback models in educational contexts. General educational models focus on different feedback elements, for example, Hattie and Timperley's model [8] aims to reduce the gap between current and desired learner performance by question prompts that teachers or students can use for more effective feedback. Other models focus on describing students' internal processing of teachers' written feedback through which to correct their incorrect responses [9] or factors affecting feedback [10]. A less researched area is the interaction between different feedback participants during feedback encounters [11]. Narciss' model [12] highlights the interactions between external-source feedback and internal (self-generated) feedback in computer assisted learning, but the interactions between the feedback participants themselves are not explored. In an attempt to provide a more comprehensive model, Panadero and Lipnevich [11] present a model of feedback typologies and thematic areas from analysis of other prominent models. Their model presents a summary of elements involved in feedback encounters, but specific details of these elements and how they interact is lacking. This limits the practical application of the model to real-time verbal clinical communication feedback encounters.

Turning more specifically to medical education, research is likely to focus on the methods for optimising the delivery of feedback [13,14]. However, no consensus exists as to the most effective feedback-giving framework or model [13] and there are many challenges faced in the provision of feedback [15]. These challenges include difficulty in providing accurate high-quality feedback [16,17]; discomfort when giving feedback especially if it may threaten a receiver's self-esteem [18,19]; lack of relationship between the feedback giver and receiver [20]; limited time allocated for feedback [16,21]; and restricted institutional support for feedback [18]. Recent research sees feedback as a dynamic process co-constructed by both feedback giver and feedback receiver. Feedback is no longer a unilateral flow of information from the expert to the learner. From this angle, researchers are more interested in learners' perceptions. Models attempt to capture the co-created and negotiated feedback purpose and use [22]; feedback frequency and quality [16,23] and influence of the institutional culture [24]. These authors also call for aids for learners to engage in feedback interactions. In order to optimise the learning, it is recommended that learners should be given guidance for receiving feedback [25,26]. The dynamic co-constructed nature of feedback and the interactions between feedback agents is often not fully represented in current feedback frameworks or models. Compiling and synthesising feedback frameworks and models to generate a comprehensive model for the unique clinical communication context may mitigate the shortfalls and support more effective communication training.

Our initial pilot literature search included all publication types, of which 92% were quantitative (5079 records out of 5510 total records). Initial screening indicated that many of these quantitative articles did not present feedback frameworks or models and were not appropriate to this study's aims. Relevant medical education feedback studies were most frequently qualitative in nature. Meta-ethnography was therefore chosen for this qualitative evidence synthesis as it facilitates generation of new interpretative models or theories which are more than aggregative compilations of previous knowledge [27]. This meta-ethnography was undertaken to develop a comprehensive feedback model for effective feedback interactions during clinical communication training.

The synthesis addressed the following questions:

(1) What are the components of frameworks or models for giving or receiving feedback about clinical communication?
(2) How does each of these components interconnect to form a comprehensive model for effective feedback interactions?

2. Methods

The seven-phase interpretive meta-ethnographic approach of Noblit and Hare [28] was followed for this review (Table 1) and findings reported in accordance with the eMERGe Meta-ethnography Reporting Guidelines [29]. Meta-ethnography is for qualitative synthesis [29] and is suited to synthesising a small number of studies, taking into account the context of the original articles. To assist in differentiating between the different types of data in meta-ethnography, we used the concept of first-, second- and third-order constructs proposed by Schutz [30], representing views of the original study participants, original study authors and review authors respectively [30].

2.1. Search strategy and selection criteria

A systematic search was conducted using the 'Population, Concept, Context' template (Supplementary Material 1) with Medical Subject Heading (MeSH) and keyword terms. Medline (Ovid), CINAHL (EBSCO), PsycINFO (OVID) and ERIC (EBSCO) databases were searched from inception until 1st October 2020 and the search strategy was customised according to the requirements of each database (Supplementary Material 2). An updated search was conducted in 2023, so that the final search encompassed publications up to 27th April 2023. We also used hand searching and snowballing to identify potential articles. Peer-reviewed qualitative studies that presented frameworks or models of verbal feedback guidance related to clinical communication in undergraduate medical education were included in this review. Similarly, book chapters, qualitative aspects of mixed methods studies and descriptive studies that presented relevant feedback frameworks or models were also included for their valuable contribution to the synthesis [31,32]. The search was limited to English language, due to resource constraints.

2.2. Data screening and quality assessment

We exported records to EndNote X9.3.3 and duplicates were removed. KM and a doctoral student independently screened titles and abstracts using Rayyan QCRI™ (https://www.rayyan.ai/) to facilitate this process. The full texts of the remaining articles were read and disagreements about inclusion were resolved through discussion among co-authors, with reasons for exclusion documented. The quality of included articles was assessed using the Critical Appraisal Skills Programme (CASP) tool for qualitative research [33].

2.3. Data extraction and synthesis

Data extraction and synthesis proceeded according to Phases 3–6 of Noblit and Hare's approach (Table 1). The "data" synthesised for meta-

Table 1
The seven-phases of meta-ethnography by Noblit and Hare [28].

Phase	Action	Description
1	Getting started	Choose the focus of the synthesis
2	Deciding what is relevant	Identify and choose studies to be included
3	Reading the included studies	Repeatedly read the studies
4	Determining how the studies are related	Decide how the studies relate to each other in terms of topic, approach, and meaning of concepts
5	Translating the studies into one another	Compare the meanings and relationships of concepts across studies
6	Synthesising the translations	Compare translations to find overarching concepts to develop new interpretations, models or theories
7	Expressing the synthesis	Communicate the synthesis in an appropriate manner

ethnography are usually the explanations and interpretations of study authors (second-order constructs) rather than the original datasets from interviews or observations (first-order constructs) [28]. The reason for this is that study authors may choose first-order constructs to support their second-order constructs [27] and review authors may not be able to access complete datasets of original studies.

2.3.1. Identifying feedback components and interconnections

We repeatedly read the included texts to gain a detailed understanding of their contents. Components of feedback guidance (which form the unit of this synthesis) were coded from each text using NVivo 12™ software in an inductive process, where codes were added or collapsed.

2.3.2. Determining how studies are related

A data extraction Excel table was developed and trialled with the first two articles chronologically. Revisions were made in discussion with co-authors. The data extraction table facilitated the process of determining how the studies were related in terms of their topic of study, educational context and components of feedback guidance. Data extracted included study characteristics, contextual information and results information.

2.3.3. Reciprocal translation of studies

Starting with the earliest text, feedback guidance components (second-order constructs) were entered into an Excel spreadsheet. Taking subsequent texts in chronological order, we compared feedback guidance components for similarities or differences and mapped these onto components from earlier texts or added them if not mentioned previously. In this way, each text was translated onto the previous text.

2.3.4. Synthesis of translations

We then compared and synthesised the reciprocal translations of second-order constructs to develop our own interpretations (third-order constructs) of feedback guidance components and their use. Decisions during the synthesis process were recorded to enhance trustworthiness of the findings [34]. A new model was created as a result of our synthesis.

2.4. Reflexivity

All authors are facilitators of clinical communication training and have experience of feedback interactions with undergraduate medical students. To mitigate potential bias in the synthesis, regular meetings took place to discuss and explore alternative interpretations. BO and SL reviewed all stages of the review and translation process to enhance trustworthiness.

3. Results

A PRISMA flowchart presents the study selection process (Fig. 1), which resulted in 14 articles for final inclusion in this review. The included studies were conducted in USA (5 studies), UK (4 studies), mixed Western countries (3 studies), Australia (1 study) and Austria (1

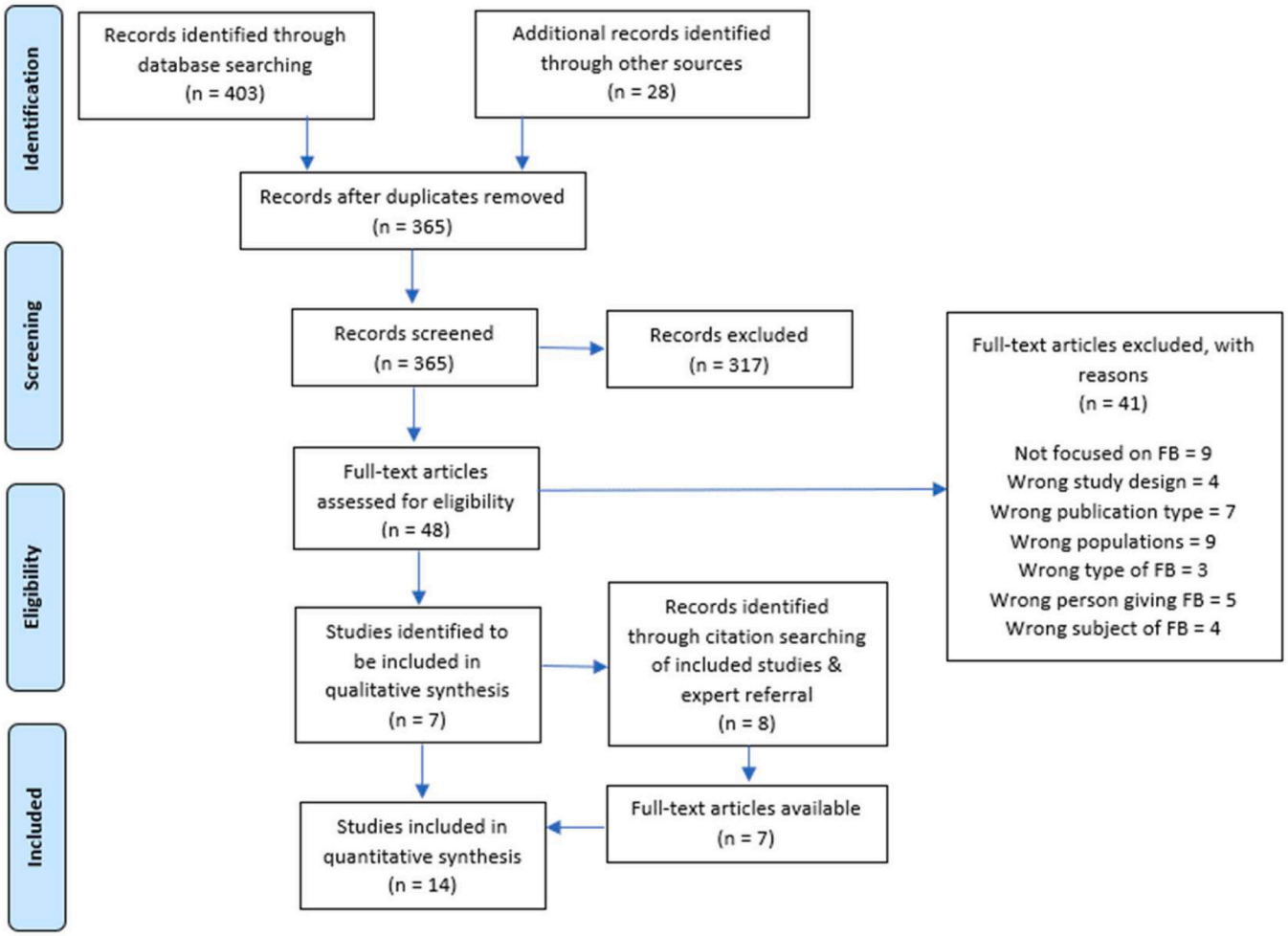

Fig. 1. Study selection process.

study). Five articles were qualitative, seven were descriptive and two were mixed methods. All studies related reciprocally in terms of having a similar focus of effective feedback guidance and containing components of feedback guidance. A summary of the characteristics of the included studies is presented in Table 2.

The second-order constructs of feedback guidance components were identified in each original article with corresponding first-order constructs identified, if present. The second-order constructs were compared and translated to give 44 themes (Supplementary Material 3). These themes were further synthesised to develop our third-order constructs of feedback guidance (Table 3) encompassing preparation for feedback conversations; learner proactivity; analysis and feedback information; feedback reception and response; facilitative actions to encourage feedback application; and future planning.

Based on the synthesis and conceptualisation, we developed a new Feedback Kidney Model for feedback guidance (Fig. 2). Its name is derived from its shape, which resembles a kidney, and from its functionality to facilitate learners to filter feedback information and absorb useful information for their professional development, which is similar to the kidney function of filtration of blood and reabsorption of useful nutrients.

Fig. 2 reflects the relationships between different participants in the feedback process during a clinical communication teaching session. Clinical communication training, the context for the model, usually commences with a tutor-led introduction to a specific communication focus for that session. A student is invited to practise communication strategies during a consultation with a simulated patient which is observed by the tutor and co-learners. Following this, feedback is given to the learner and the learner may respond to the feedback. The primary focus in this model is the interaction between the tutor and the learner, which is represented in the centre of the diagram. Co-learners and a simulated patient are also included in the feedback process but are in a peripheral location. The diagram is to be read from top to bottom, following a sequence of pre-consultation, consultation, and post-consultation stages. This design indicates that the feedback process is temporally connected to the preceding and following activities within the constantly evolving learning event in the classroom. The central part of the model is the feedback information. The lower segment of the diagram represents activities that can occur following feedback conversations. Influencing factors for the different parties involved are given on each side of the diagram. The dotted arrows indicate the cyclic and ongoing nature of feedback. The main processes included in the Feedback Kidney Model are *(a)* preparation; *(b)* learner proactivity; *(c)* analysis and feedback; *(d)* reception and response; and *(e)* influencing factors. Each component in the Model has an alpha-numeric reference to assist the reader in tracking the various processes in the subsequent

Table 2
Summary of Included Studies.

No.	Authors	Country of Study	Subject of Feedback	Setting	Type of Study	Sample	Data Collection	Model
1	Hewson and Little[23]	USA	Clinical communication	Medical education	Mixed methods	64 doctors & 19 behavioural scientists	Written narratives & survey	Feedback model
2	Brukner[35]	USA	Medical behaviours & professionalism	Undergraduate medical education	Descriptive	Not specified	Not specified	Specific feedback strategies for different types of students
3	Lang et al. [36]	USA	Clinical communication	Undergraduate medical education	Qualitative	2 medical students, number of doctors not specified	Observations, interviews, group discussions	Insights from real-time feedback
4	Pendleton et al.[37]	UK	Clinical communication	Medical education	Descriptive (book chapter)	Not specified	Not specified	Pendleton's Feedback Guidelines
5	Kurtz et al. [5]	Canada & UK	Clinical communication	Undergraduate medical education	Descriptive (book chapter)	Not specified	Not specified	Agenda Led Outcome Based Analysis (ALOBA)
6	Milan et al. [38]	USA	Any medical activity	Medical education	Descriptive	Not specified	Not specified	PEARLS Model and Stages of Change Model adapted for feedback encounters
7	Cantillon and Sargeant [2]	Ireland & Canada	Any medical activity	Medical education	Descriptive	Not specified	Not specified	Interactive feedback approach model
8	Archer[22]	UK	Clinical communication or medical behaviour	Medical education	Descriptive	Not specified	Not specified	Culture and continuum feedback model
9	McKinley et al.[39]	UK	Clinical communication & clinical procedures	Undergraduate medical education	Qualitative	3 tutors	Delphi process (4 iterations)	Glossary of strategies for improvement
10	Schopper et al.[16]	USA	Clinical communication	Undergraduate clinical placements	Qualitative	4th year medical students - 125	Semi-structured interviews	Recommendations
11	Molloy et al. [40]	Australia	Any activity	Education	Qualitative	University students - 28 for focus groups, 20 for interviews	Focus groups, interviews	Student feedback literacy framework
12	Ramani et al. [24]	USA, Netherlands, Canada	Clinical communication or medical behaviour	Medical education	Descriptive (AMEE guide)	Not specified	Not specified	Model for growth enhancing feedback
13	Hall et al. [41]	UK	Clinical communication & physical examination	Undergraduate clinical placements	Mixed methods	3rd year medical students - 33 for survey, 10 for focus groups	Survey and focus groups	FEEDBCK Model
14	Wagner-Menghin et al.[42]	Austria	Clinical communication	Undergraduate medical education	Qualitative	10 doctors, 7 non-doctor educators	Observations	Adapted cue-utilization model

Table 3
Synthesis of translations of feedback guidance components arranged in approximate temporal sequence.

Category	Translated Constructs	Summary Definition of Translated Constructs	Record Number
Preparation	Appropriate time & location	Time and setting appropriate for feedback conversations	1,4
	Learning culture	Respectful, friendly, open-minded, unthreatening atmosphere, where learners can take risks and experiment, focus on mastery not self-image	1,4,5,8,12
	Relationship	Supportive, trust-based, partnership / alliance leading to feedback conversations	5,6,7,11,12
	Set learning objectives, roles & responsibilities	Tutor explains aims / goals of the session in relation to the curriculum / assessment criteria Tutor explains expectations & responsibility to use recommended feedback techniques; learner responsibility to appraise & use feedback	1,3,4,5,7,8,9,11,12,13
	Share & negotiate agendas	Learner describes their learning orientated goals / objectives Learner considers what the (simulated) patient wants to achieve in the consultation Tutor introduces their agenda for session Tutor & learner negotiate to reach shared goals for session (purpose of feedback)	1,2,3,4,5,7,8,9,11,12,13
Learner Proactivity	Pre- & post-consultation feedback request	Learner can request and initiate feedback conversations, choosing what behaviour / skill they want feedback about pre- & post-consultation	1,3,5,7,10,11,12
	Learner self-reflection	Learner considers & explores own clinical communication to understand events, and may assess what went well and what can be improved	1,2,4,5,7,8,10,11, 12,13,14
	Learner problem solving	Learner suggests ways to improve their clinical communication	1,5,7
	Learner readiness to change	Tutor analyses how open & prepared the learner is to change their practices	6
Feedback Type	Metacognition	Tutor interprets patient's experience / feelings & prompts learner to share their thoughts. Learner considers what patient was trying to achieve in consultation (patient outcome)	5,14
	Reinforcement	Feedback given about what worked to achieve outcomes	1,2,3,4,5,7,9,10, 12,13,14
	Correction	Feedback given about what did not work to achieve outcomes	1,3,4,5,7,8,9,10, 12,13
	Omission	Feedback given about what was missing	6,9,14
Feedback Quality	Links to learner's agenda	Feedback related to the learner's initial learning goals / objectives	1,5,8,12,13
	Relates to observation	Feedback about observed clinical communication that can be changed	1,2,4,5,7,8,9,10, 11,12,14
	Preserves face / self-esteem	Feedback that is sensitive to the learner's self-esteem (sense of worth); self-efficacy (confidence in ability to succeed) & face (projection of positive image / autonomy). Well intentioned feedback with the aim to assist the learner.	4,5,8,9,12
	Uses appropriate vocabulary	Feedback given using descriptive, non-judgemental words and vocabulary relevant to clinical communication	1,4,5,7,10,12,13
	Specific	Clear & detailed feedback information but not overly specific	1,2,3,4,5,6,7,8,9,10,12
	Selective	Focused, limited amount of feedback	1,4,5,7,8
	Timely	Feedback given immediately or soon after the event, without interrupting task	2,3,4,5,7,8,10,13
Feedback Reception & Response	Feedback impact & appraisal	Leaner recognises & manages emotional impact of feedback. Learner appraises feedback & accepts or rejects it.	3,11,12
	Group problem solving	Tutor invites learner & peers to give suggestions for how to improve practice	3,5,6
	Rehearsal & Application	Learner & peers have opportunities to rehearse suggestions & apply feedback	1,4,5,7,11,13
Facilitative Actions	Legitimise & understand emotions	Tutor legitimises learner emotion; recognises different learners respond differently; displays cultural sensitivity; uses empathetic understanding	3,5,6,8,11,12
	Coach	Tutor applies coaching strategies during feedback conversations	1,12
	Suggest & model improvements	Tutor gives suggestions for learner to use to improve practice & can model these strategies	1,2,4,5,6,7,9,11,12,13
	Share knowledge / theory	Tutor introduces theory & expert knowledge/ experience	1,3,5,10
	Check understanding	Tutor checks learner understanding	1,5,7
	Offer support	Tutor offers future support / resources to assist future practice	1,2,5,6,7,8,12
Future Planning	Summarise	Tutor reviews & summarises main points of the session	1,3,5
	Key take home point	Learners reflect & choose one priority goal for future improvement	9,11,13
	Ongoing process	Feedback process is frequent, ongoing, sequential process	5,7,8,9,10,11,12,13

written presentation of results. The overall flow of the diagram is from top to bottom. However, the numerical order is not to be taken as a sequential temporal order, as the components interact in a more dynamic, complex manner in practice.

Each of the processes will be explained in more detail with reference to the different alpha-numeric components in Fig. 2.

3.1. *Preparation for feedback conversations*

Feedback encounters are each situated within a unique physical, relational and cultural environment. The tutor needs to carefully consider the influence of each of these components [23]. This may require the tutor to re-organise the physical layout of the training room *(P1)* to be more inclusive, for example, by placing chairs in a circle rather than in a straight line. The tutor and learners may also need to re-negotiate the relationship between themselves *(P3)*. A hierarchical relationship that views the tutor on a higher level than learners may restrict learner proactivity and agency in feedback encounters [5]. In contrast, fostering a respectful, supportive partnership between the tutor and learners may promote learner participation and involvement [2,5,35,38,40]. Similarly, nurturing a culture of learning *(P2)* can increase learners' readiness to engage with the feedback process, as a learning culture supports experimentation and exploration of different communication practices [5,24,37,40].

Within the context of a respectful partnership *(P3)*, the tutor maintains the responsibility of setting the curriculum objectives for the session *(P4, P5)*. Each training session presents unique medical issues and communication challenges; therefore, setting objectives gives clarity to the learners and can help them to make connections across training sessions [22,41]. Different learners may have different learning needs, so prior to conducting a simulated consultation, the tutor can invite the potential feedback recipient – the learner – to reflect on and share their developmental needs *(P6)* [22,24,36–38,40,41]. If there is a discrepancy between the learning agenda suggested by the tutor *(P7)* or simulated patient *(P8)* and that raised by the learner *(P6)*, careful discussion is required to reach a consensus of the focus for learning *(P9)* [5,23,37,41]. This can facilitate the tutor sharing subsequent feedback information after the simulation that is relevant to both the learner and the

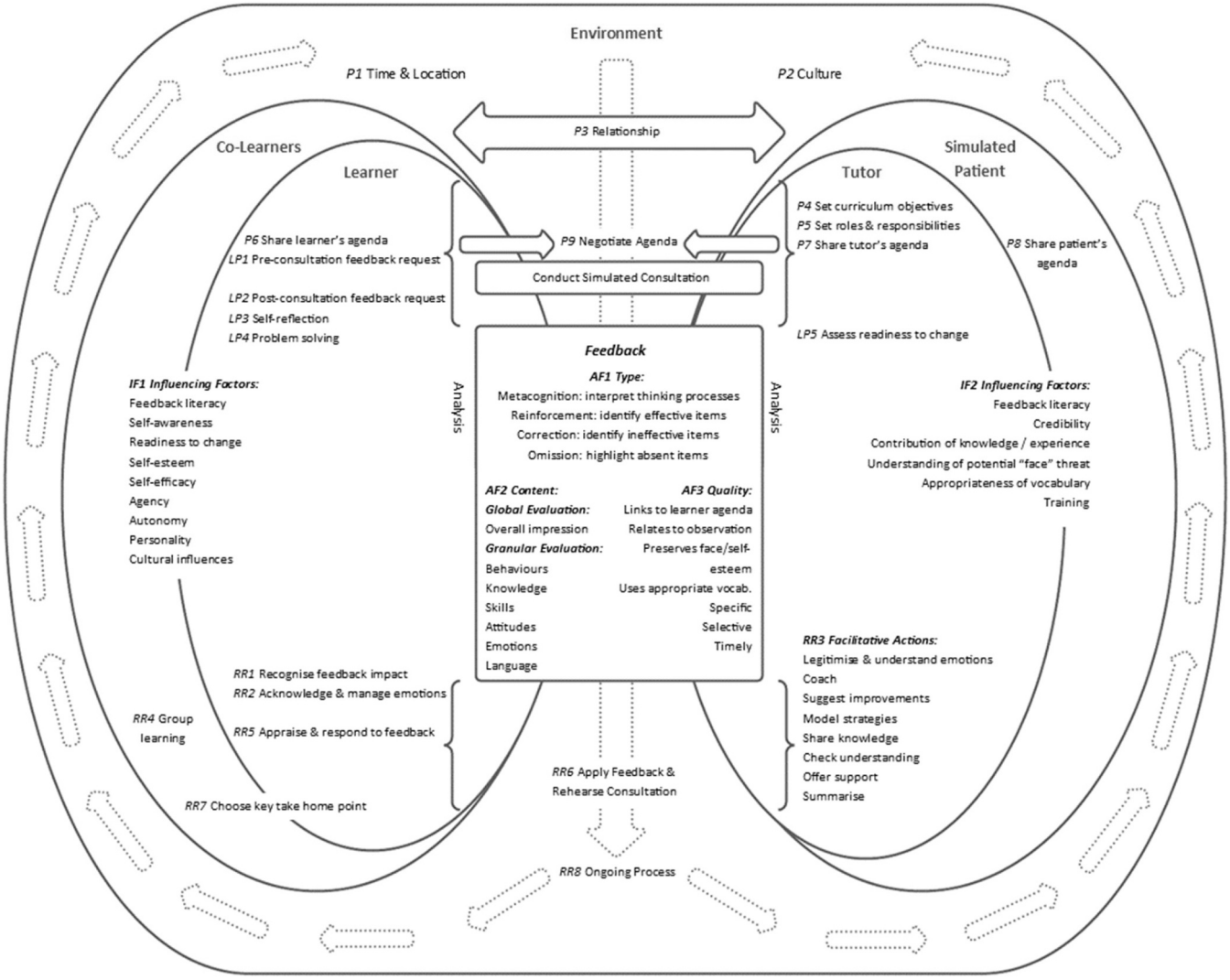

Fig. 2. Feedback Kidney Model.
Key: Main processes of the Feedback Kidney Model (a) Preparation P1-P9; (b) Learner Proactivity LP1-LP5; (c) Analysis and Feedback AF1-AF3; (d) Reception and Response RR1-RR8; (e) Influencing Factors IF1-IF2.

wider group of co-learners [5,23].

3.2. Learner proactivity

A proactive learner initiates activities that benefit their learning, for example, requesting a feedback focus related to their developmental needs *(LP1, LP2)* [5,16,22–24,40]. Prior to engaging in feedback discussions, the learner can actively reflect on their conduct and suggest communicative strategies for improvement *(LP3, LP4)* [2,22,41,42]. This reduces learner defensiveness to hearing feedback from others [5] and prepares the learner for the feedback conversations that will follow [24]. The learner's reflections about their communication also give the tutor an indication of the learner's readiness to change *(LP5)* [38]. The tutor can then tailor their feedback accordingly, to assist learner movement in the change cycle [38]. Learner proactivity is also required to process, assimilate and respond to feedback information which will be reported in section 3.4.

3.3. Analysis and feedback

At the core is feedback information. Accurate feedback information requires careful analysis of communication strategies applied by the learner during the simulated consultation. Collaboratively, the tutor and learner (and possibly the co-learners and simulated patient) can analyse what worked or not, to achieve the desired consultation outcomes [2,5,37]. To aid this analytic process, specific tools or frameworks can be utilised, such as the Clin-Comm Tool [43] which provides a conversational analytic framework for consultations.

Feedback information can be categorised into type *(AF1)*, content *(AF2)* and quality *(AF3)*. The objectives of the session and learner needs will direct the tutor's choice for the feedback content *(AF2)*. Feedback content can give an overall impression, or granularly focus on behaviours, knowledge, skills, attitudes, emotions or language.

Four feedback types *(AF1)* were identified: metacognition, reinforcement, correction, and omission. 'Metacognition' requires the tutor to elicit and interpret the learner's perspectives about the patient's experience and desired clinical outcomes [5,42]. For example, the tutor can prompt the learner: 'How do you think the patient felt when you asked …?'. This type of feedback focuses on developing the learner's understanding of their own and the patient's thinking processes during the consultation, which can help improve the learner's choice of relevant communication strategies [42].

The second type of feedback information is 'reinforcement' which acknowledges the behaviours and skills that the learner demonstrated to

achieve the desired consultation outcomes [2,5,16,23,24,35–37,39,41,42]. Reinforcement feedback increases learner confidence and encourages the leaner to maintain good practice. Conversely, the tutor can point out behaviour or skills that did not achieve the desired outcomes through the third type of 'correction' feedback [2,5,16,22–24,36,37,39,41]. Finally, absent behaviour or skills can be noted through feedback on 'omission' [38,39,42]. Correction and omission feedback enable the leaner to develop and improve their communication practices, but certain feedback qualities *(AF3)* are required.

These desirable qualities *(AF3)* of feedback information include specific feedback of observed practices, linked to the learner's needs, with careful use of language to maintain the learner's self-esteem and given in a timely fashion [5,16,22–24,35–42]. Observation can cause some learners to feel nervous and they may alter their performance so that it does not reflect their true capacity in conducting a consultation [16]. To minimise learner discomfort and preserve their sense of self-worth during a feedback conversation, the tutor can use appropriate non-judgemental descriptive language [5,23,24,37,38,41]. The amount of feedback needs to not overwhelm the learner and be specific enough to be actionable [2,5,22,23]. However, overly specific feedback is equally unhelpful as it reduces the learner's attention on the feedback [16].

In terms of the order of feedback type, there are contrasting views in the literature. Primary studies mainly support the use of giving reinforcement feedback prior to correction feedback [23,24,35–37,39,41], as initial reinforcement can increase learner's confidence and motivation [24,37]. In contrast, other authors suggest that meta-cognitive feedback be given first to stimulate learner self-reflection [42] and some suggest that initial correction feedback can be received by a learner, if a supportive environment has been created [5]. Therefore, the Feedback Kidney Model does not specify the order so that the tutor can choose the most appropriate feedback type according to their analysis of the situation.

3.4. Reception and response

Learner reception, appraisal and response to feedback *(RR5)* are vital for feedback to achieve its intended purpose. Learner proactivity is again required at this stage for a learner to attend to, receive, appraise, discuss and respond to feedback. To maximise learner attention to and reception of feedback, it is important for the learner to recognise and manage the emotional impact of the feedback on themselves *(RR1, RR2)* [24,36,40]. Following reception of the feedback, the learner can appraise the information and choose to discuss, accept or reject all or part of it. To assist the learner in this process, the tutor may deploy a range of supportive mechanisms *(RR3)* such as, legitimising the learner's emotions [5,24,36,38], coaching the learner [23,24], modelling suggestions for improvement [23], checking the learner's understanding [2,5,23] and so forth. These strategies can facilitate group learning *(RR4)*, as co-learners may also identify with issues raised by the feedback information and can suggest to the learner alternative ways to perform the consultation in order to achieve the desired outcomes [5,36,38].

The learner may respond to feedback by applying points raised in a repeat consultation *(RR6)* [2,5,23,37,40,41]. This can cement the learning and enable it to be incorporated into future practice [5,37]. As indicated by the dotted arrows in the Model, the whole feedback process can be repeated *(RR6)* in the current training session or future sessions, which can benefit the same learner, or a new learner [5,41]. At the end of the teaching session, the tutor can give a final summary and learners share key points *(RR7)*, to clarify learning from the feedback and strengthen future application *(RR8)* [41].

3.5. Influencing factors of parties involved

Several positive influencing factors by different parties are included on both sides of the kidney model *(IF1, IF2)*. A factor required by all parties is feedback literacy. The tutor, simulated patient and learners display feedback literacy when they understand and have the capability to appreciate and appraise feedback information with recognition of the potential emotional impact [40]. Learners may possess other positive influencing factors, which are represented on the left-hand side of the diagram *(IF1)*. When learners have the capacity to appraise their own behaviour and are ready to make changes, they are more confident and willing to engage in feedback conversations [24,38]. As learners develop their self-esteem and learn how to manage the potential threat of feedback information to their 'self', they become more receptive to feedback [24]. Learners can initiate and direct feedback conversations for the benefit of their learning when they possess agency and autonomy in feedback conversations [2,24]. A learner's personality and cultural background also have either a positive or negative influence on feedback conversations [22,23].

The tutor and simulated patient also bring in positive influencing factors which are represented by the overlapping feature on the right-hand side of the diagram *(IF2)*. The tutor or simulated patient being a credible, knowledgeable feedback source enhances the trustworthiness of feedback information [22,36]. When the tutor or simulated patient use appropriate language, it can increase learners' understanding of the feedback process and feedback information [39,40], as well as preserve learners' self-esteem or 'face' [24]. Training can help the tutor and simulated patient to acquire and utilise these factors more effectively [23,24].

4. Discussion and conclusion

4.1. Discussion

The Feedback Kidney Model is a new diagrammatic representation to show how feedback components interconnect to form a system for effective feedback cycles. It is the first presentation of the feedback process as a comprehensive system, reconceptualising the feedback as a complex system in which the feedback process is shaped by the interactions among learners, tutors and simulated patients within a dynamic learning context. This aligns with systems thinking, underpinned by complexity theory, where the interactions and relationships between components (people and objects) in a system and the conditions of the system, influence the behaviour and emerging outcomes of the system [44–46]. Within complex systems, phenomena do not usually follow top-down goal-driven structures but control is decentralised [44,45]. This is reflected in the Kidney Model, as the feedback process develops through negotiation of agendas and learner pre- and post-consultation feedback requests, as well as group input, leading to evolving learning outcomes.

It is also important to recognise that phenomena in complex systems arise from and input into other systems [44,45]. Therefore, the feedback process must not be viewed in isolation as it is nested within other systems of the educational process. Our Model has been developed for the undergraduate clinical communication context, but its application will impact other educational processes.

Our Model emphasises the importance of the learner throughout the feedback process as a co-participant in feedback interactions. This resonates with the work of Telio et al. [4] who conceptualise feedback as a dialogic process between a tutor and learner. Investment in this educational relationship is paramount to empower the learner proactivity highlighted in the Model. One component of the learner proactivity is to recognise the potential emotional impact of feedback information on them. In the context of multi-source feedback, Sargeant et al. [47] found that learners experienced negative emotions when there was a mismatch between their self-perceptions and the feedback information. The Kidney Model encourages facilitated reflection, assessment of readiness to change and recognition of emotional reactions, to help learners gain more accurate self-perceptions and develop skills to manage their emotions. Harnessing the negative

emotional impact of feedback information can motivate learners to make transformational changes to their practices [48].

One reason for negative emotional reactions is that the feedback information poses a threat to the learner's sense of self-esteem or 'face' [24]. Therefore, the Kidney Model incorporates the tutor recognising this threat and sharing feedback information that preserves the learner's 'face'. To assist in this process, the tutor can employ politeness strategies [49] to reduce learner defensiveness to receiving feedback. However, some authors caution that feedback information that is too polite may lose the original meaning and thus prevent learners from understanding and applying the feedback [18].

The Feedback Kidney Model includes the process of learner reception and response to feedback information, yet the detailed aspects of this process are under-researched. Learners' uptake and interpretation of feedback information increases when the feedback is perceived as accurate or given with beneficial intentions [50]. However, learners may possess bias in their cognitive reasoning processes (for example, attributing poor performance to external circumstances) [50,51] leading to inaccurate appraisal of feedback information and limited response.

4.1.1. Limitations

The Kidney Model was developed from studies primarily conducted in Western countries, in undergraduate medical education. Therefore, the Model may have limited applicability to other cultural and educational contexts.

The CASP tool [33] was used to evaluate adequacy of studies but the tool is more applicable to qualitative articles rather than book chapters or descriptive articles which have a limited number of participant quotes (first-order constructs) restricting the linkage of third-order constructs through to original first-order constructs. However, all included studies had findings that were relevant to the overall synthesis [52] and added to the conceptual feedback model.

4.2. Practice implications

The Model has several anticipated practical implications. Firstly, the feedback process is anticipated to be more time efficient and lead to scaffolded learning [36,41]. Secondly, developing the relationship between the tutor and learner may lead to increased trust, mutual understanding and collaborative learning [2,5,22,24,38]. Thirdly, using the components in the central 'feedback' box in the Model, it is anticipated that feedback information will be more credible, consistent, focused, meaningful and less threatening to learners [2,5,16,22–24,35,36,39,41]. This may help the learner to feel less overwhelmed, less demoralised and less defensive, promoting reflection on and assimilation of the feedback information. Finally, active involvement of the learner may result in development of a growth mind-set, increased learner self-efficacy, agency and autonomy [5,22,24,37,39,40]. This will encourage learners' application of the feedback, and engender changes in their attitudes and behaviours to improve their practice in future independent learning [2,5,16,24,36,37].

4.3. Conclusion

The Kidney Model, extends our understanding of feedback components and their use, to optimise feedback interactions in undergraduate clinical communication simulations. It is a helpful conceptual model to guide feedback conversations for medical educators and students and to inform future research of feedback interactions.

Ethical Approval

No ethical approval was required as this research did not involve the direct study of human participants. This research represents a synthesis of previously published literature.

CRediT authorship contribution statement

Li Shuangyu: Writing – review & editing, Visualization, Validation, Supervision, Resources, Methodology, Formal analysis, Conceptualization. **O'Neill Bernadette:** Writing – review & editing, Visualization, Validation, Supervision, Resources, Methodology, Formal analysis, Conceptualization. **Miles Katherine:** Writing – original draft, Visualization, Software, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of Competing Interest

The authors report no conflict of interest.

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Data Availability

The data sets are available in the Mendeley Data Repository.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.pec.2023.108050.

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