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Doctor role modelling in medical education: BEME Guide No. 27

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Abstract

Aim: The aim of this review is to summarise the evidence currently available on role modelling by doctors in medical education.

Methods: A systematic search of electronic databases was conducted (PubMed, Psyc- Info, Embase, Education Research Complete, Web of Knowledge, ERIC and British Education Index) from January 1990 to February 2012. Data extraction was completed by two independent reviewers and included a quality assessment of each paper. A thematic analysis was conducted on all the included papers.

Results: Thirty-nine studies fulfilled the inclusion criteria for the review. Six main themes emerged from the content of high and medium quality papers: 1) the attributes of positive doctor role models; 2) the personality profiles of positive role models; 3) the influence of positive role models on students' career choice; 4) the process of positive role modelling; 5) the influence of negative role modelling; 6) the influence of culture, diversity and gender in the choice of role model.

Conclusions: This systematic review highlights role modelling as an important process for the professional development of learners. Excellence in role modelling involves demonstration of high standards of clinical competence, excellence in clinical teaching skills and humanistic personal qualities. Positive role models not only help to shape the professional development of our future physicians, they also influence their career choices. This review has highlighted two main challenges in doctor role modelling: the first challenge lies in our lack of understanding of the complex phenomenon of role modelling. Second, the literature draws attention to negative role modelling and this negative influence requires deeper exploration to identify ways to mitigate adverse effects. This BEME review offers a preliminary guide to future discovery and progress in the area of doctor role modelling.

Section 1: Introduction

Role modelling has been highlighted as an important phenomenon in medical education. Its importance in professional development of learners has been illustrated by medical educators' worldwide (Gordon & Lyon 1998; Skeff & Mutha, 1998; Ficklin et al. 1998; Yazigi et al. 2006; Joubert et al. 2006; McLean, 2006). Over the past decade there has been an explosion of interest in doctor role modelling with many influential discussion articles (Matthews 2000; Maudsley 2001; Paice et al. 2002; Kenny et al. 2003; Kahn 2008; Cruess et al. 2008). These leading articles inspired this review of the primary research on role modelling.

Role modelling has been described as the process in which 'faculty members demonstrate clinical skills, model and articulate expert thought processes and manifest positive professional characteristics.' (Irby 1986, p. 40). This is the definition that was chosen for this systematic review. Role modelling takes place in three interrelated educational environments which are the formal, informal and hidden curriculum (Hafferty 1998). The informal curriculum is defined as an 'unscripted, predominantly ad hoc, and highly interpersonal form of teaching that takes place among and between faculty and students;' and the hidden curriculum has been defined as a 'set of influences that function at the level of the organisation and culture.' (Hafferty 1998, p. 404).

Role models are different from mentors as they influence and teach by example whereas mentors have a formal relationship with the student (Ricer 1998). Role modelling is elusive, as there are no standards and the importance of role modelling remains unclear, in particular, the relative strengths of role modelling when compared with more traditional approaches to teaching is not fully understood (Passi et al. 2010). Therefore, an up to date exploration of the influences of role modelling in medical education is required.

In summary, although there is a growing body of literature on doctor role modelling, there has been no systematic analysis of the evidence about doctor role modelling in medical education. Therefore, we set out to conduct a systematic review to analyse and synthesise the evidence on doctor role modelling with the aspiration that this evidence will provide important recommendations for clinical practice and future research.

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Practice points

- Clinical teachers can enhance their status as role models. To be an effective role model, clinical teachers must be encouraged to develop a conscious awareness of role modelling, in which they specifically think about being role models when interacting with learners. Role modelling should be explicit in clinical teaching, as it is important for teachers to make an intentional effort to articulate what aspects they are modelling.
- Clinical teachers need to be aware of the profound influence they exert on recruitment to specialities and that the level of enthusiasm they display for their job is a compelling factor.
- Medical leaders need to develop strategies to ensure the organisational structure supports a culture of excellence in doctor role modelling. This will involve developing innovative faculty development initiatives and may require establishing valid methods of evaluating the performance of faculty in addition to the provision of opportunities for self-improvement through faculty development.
- Medical educators worldwide need to collaborate and share ideas to develop excellence in role modelling; as this in turn will ensure high standards of patient care.

Aims

The aim of this review is to summarise the evidence currently available on role modelling by doctors in medical education.

Objectives

The objectives of this review are to determine:

- The characteristics of effective doctor role models in medical education.
- The influences of doctor role modelling in medical education.
- The importance of doctor role modelling worldwide

Section 2: Review Methodology

We prepared a protocol for the review based on the methodology recommended by the Best Evidence Medical Education (BEME) collaboration.

(http://www.bemecollaboration.org/Reviews)

Inclusion and exclusion criteria

The inclusion criteria included all primary research studies on doctor role modelling by doctors in both undergraduate and postgraduate medical education. Following the initial scoping study published on the development of medical professionalism in future doctors (Passi et al. 2010), it was determined that the majority of the literature on role modelling was from 1990 onwards and hence the literature search was conducted from 1990 to 2012. Only English language studies were included in the review. The search strategy excluded studies documenting role modelling by other healthcare professionals. Also, descriptive articles without evaluative methodology were excluded.

Search strategy

Seven electronic databases were searched: PubMed, PsycInfo, Embase, Education Research Complete, Web of Knowledge, ERIC and British Education Index. All were searched from January 1990 to February 2012 and were limited to English language. The literature searches were conducted in February 2012. The medical subject headings (MeSH) and keywords used were *role models, role modelling, role modelled, medical education, doctor and physician*. The detailed searches conducted in each database are provided in Appendix 1. A medical librarian (S. J.) was involved in the construction of the search strategy.

Initial appraisal of literature search

The flow diagram of the complete search is illustrated in Figure 1. Following initial piloting of the draft criteria by analysis of three papers (V. P., E. P.), two independent reviewers (V. P., S. J.) used the exclusion/inclusion criteria to assess all electronic citations generated by the search and decided, on the basis of the title and abstract, whether the citation was relevant to the topic. Clearly irrelevant items were identified and eliminated, before the full text articles for all potentially relevant citations were obtained. A second stage involved the lead reviewer excluding any full text articles which did not meet the inclusion criteria. To ensure that all key studies were included, the reference lists of the final review studies identified through the primary search were searched by the lead reviewer for additional references and hand searching of relevant articles in Academic Medicine and Medical Education from January 1990 to February 2012 was conducted. All references identified through searching were entered into an Endnote Web Library, Version 3.3 and duplicate references removed, first automatically and then manually. The final reference list was shared with all expert co-authors and they did not suggest the inclusion of any other important papers (E. P., F. H., S. W., N. J.).

Quality assessment of studies

The review team discussed in detail the most appropriate tool to use in this review for the quality assessment of the included papers (V. P., S. J., E. P., S. W., F. H., N. J.). The methodological quality of each included study was assessed using the tool validated by the BEME Review on Education Portfolios (Buckley et al. 2009). This tool formed the basis of our data extraction sheet and is provided in Appendix 2. This tool included eleven quality indicators relating to the appropriateness of the study design, results, analysis and conclusions. Higher quality studies were considered to be those which met a minimum of eight of these quality indicators, medium quality studies were those that met six or seven criteria, and low scoring papers were those meeting five or fewer of the criteria.

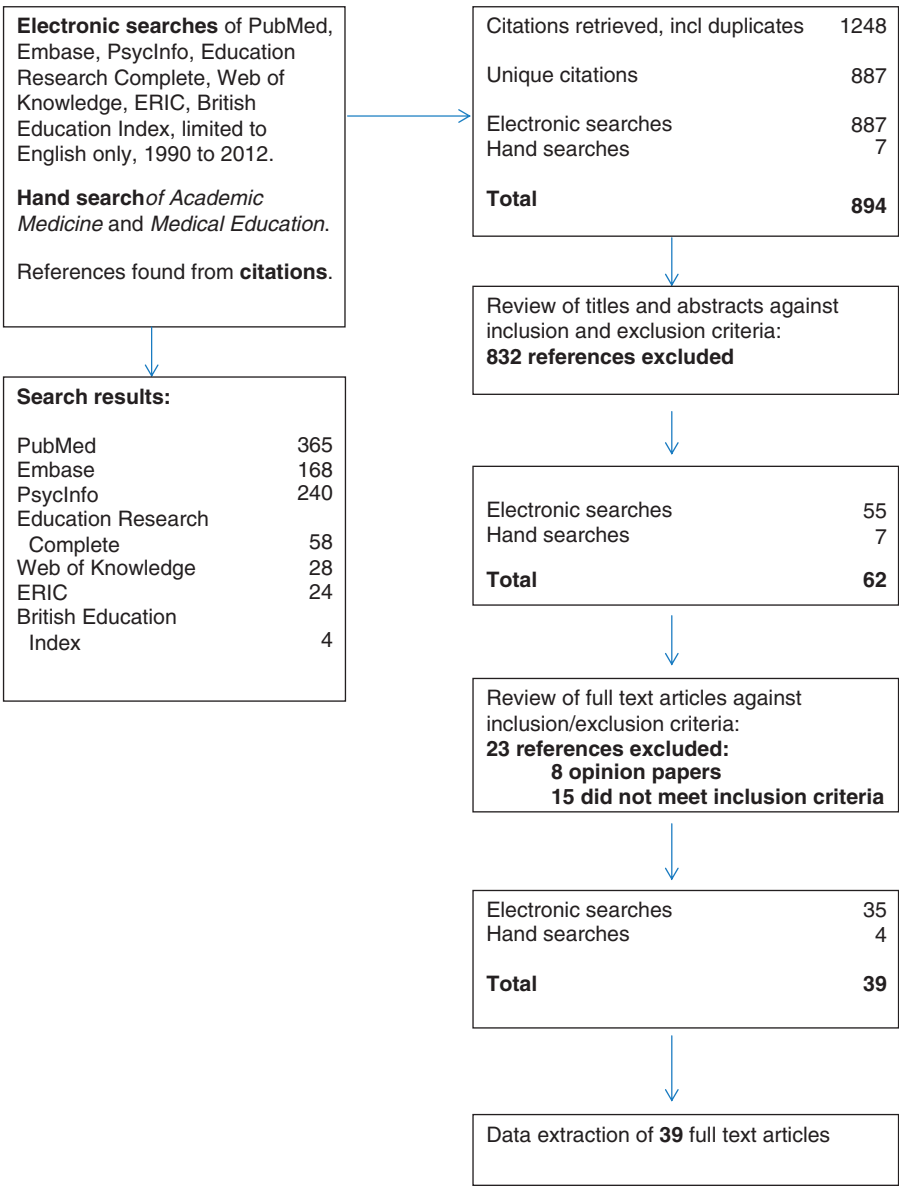

Figure 1. Flow diagram of search process.

Data extraction

An initial pilot of the data extraction sheet (Appendix 2) was conducted by two authors each reviewing the same paper (S.J., V.P.); based on that pilot no changes to the data extraction sheet were considered necessary. The pilot results were then reviewed by a two further reviewers for their opinion on the suitability of the data extraction sheet and quality assessment tool (E.P., N.J.). Two assessors then independently extracted data from all full text articles selected (V.P., S.J.) and the extracted information was systematically collated onto data extraction forms.

Discrepancies in the total scores were resolved by discussion and consensus. A total of eight papers had two points or more difference between the initial scores of two reviewers (V.P., S.J.). With their independent data extraction coding sheets in front of them, V.P. and S.J. conducted a joint, detailed review of each paper before arriving at a consensus decision on the final score. The information from the all data extraction sheets was summarised and is presented in the table in Appendix 3.

Data analysis and synthesis

A thematic analysis was conducted. On the BEME Coding sheet in Section 3, the main influences of role modelling were coded by two independent reviewers (V.P., S.J.). The main emergent themes on doctor role modelling in undergraduate and postgraduate education were summarised (V.P.) and debated and distilled (V.P., N.J., E.P.). No statistical integration of data findings was possible due to the predominantly descriptive nature of the results. The findings were integrated into a narrative structure, drafted by V.P. The original publications were checked (V.P., S.J.) to see if important themes had been missed in a process which was framed by our extraction sheet design. No new themes were identified.

Table 1 illustrates the main emergent themes and the associated references. Debate within the group centred on

Table 1. Summary of the main themes and associated references.

Theme	Theme	Papers
1	Attributes of positive role models	Wright, 1996; Wright et al. 1998; Althouse et al. 1999; Cote and Leclere, 2000; Matthews, 2000; Elzubeir and Rizk et al. 2001; Wright and Carrese, 2001; Wright and Carrese, 2002; Mclean, 2004b; Joubert et al. 2006; Weismann et al. 2006; Yazigi et al. 2006; Mclean, 2006; Wyber and Egan, 2007; Lynoe et al. 2008; Lombarts et al. 2010.
2	The personality profiles of positive role models	Magee and Hojat, 1998; Hojat et al. 1999.
3	Influence of positive role models on student's career choice	Henderson et al. 1996; Wright et al. 1997; Ambrozy et al. 1997; Watts et al. 1998; Basco and Reigart, 2001, Drouin et al. 2006; Berman et al. 2008; Ravindra and Fizgerald, 2011.
4	The process of positive role modelling	Jones et al. 2004; Thiedke et al. 2004;Balmer et al. 2007; Taylor et al. 2009; Park et al. 2010; Curry et al. 2011; Thiedke et al. 2004.
5	The influence of negative role modelling	Murakami et al. 2009; Wear et al. 2009; White et al. 2009.
6	The influence of culture, diversity and gender in the choice of role models.	Neumayer et al. 1993; Wright and Carrese, 2003; Mclean, 2004a; Shortell and Cook, 2008.

how to reflect the reliance that we attached to the papers (in the light of quality scoring) in considering the themes. There was rapid consensus on the importance and distinctiveness of the first five of the six themes listed. Eventually, we decided to include the sixth theme, describing the results in three sections illustrating the focus of the high, medium and low scoring papers to demonstrate the strength of the current evidence on role modelling.

Section 3: Results

The search strategy identified 1248 articles of which 887 were unique references. An additional three references were identified via hand searching of *Academic Medicine* and *Medical Education* and four references via citation searching. A total of 832 papers were excluded after a review of title and abstract. A further 23 were excluded after a review of the full paper. The total number of papers included in the final review is 39. Figure 1 illustrates the search and identification process of papers included in the review.

The majority of the papers are from the United States of America (23 papers), but there is a broad international representation with papers from South Africa, Canada, Europe, United Arab Emirates, Lebanon, Australia, New Zealand and Japan. Twenty-nine of the 39 papers were published from 2000 to 2012.

These 39 papers consist of 25 high scoring papers, 11 medium scoring papers and 3 low scoring papers. The Summary Table indicating the individual scores for each paper is provided in Appendix 3, and the associated references are provided in Appendix 4.

The predominant enquiry method used in the studies was a questionnaire. Of the included studies, 23 papers used questionnaires, 9 studies used semi structured interviews, 2 studies used focus groups and 1 study was an observational study. Four studies used mixed methods including interviews and observations.

The high scoring papers

Five main themes (described below) emerged from the content of the high scoring papers: 1) the attributes of positive doctor role models; 2) the personality profiles of positive role models; 3) the influence of positive role models on students' career choice; 4) the process of positive role modelling; 5) the influence of negative role modelling. These themes are described below.

Theme 1: The attributes of positive doctor role models.

This systematic review identified eleven papers focusing on the attributes of positive doctor role models (Wright 1996; Wright et al. 1998; Althouse et al. 1999; Cote & Leclere 2000; Elzubeir & Rizk 2001; Wright & Carrese 2001, 2002; Joubert et al. 2006; Weissmann et al. 2006; Wyber & Egan 2007; Lombarts et al. 2010). The attributes of the positive role models can be divided into three main domains: clinical attributes, teaching skills and personal qualities (Wright 1996; Elzubeir & Rizk 2001).

Clinical attributes. To be considered a role model by learners, an excellent of level of clinical knowledge and skills were required in addition to a patient centred approach (Wright 1996; Wright et al. 1998; Althouse 1999; Wright & Carrese 2002; Yazigi et al. 2006; Wyber & Egan 2007; Lombarts et al. 2010). A predominant theme identified was the importance of modelling humanistic behaviours (Althouse et al. 1999; Cote & Leclere 2000; Elzubeir & Rizk 2001; Joubert et al. 2006; Weissmann et al. 2006). Humanistic behaviours encompassed many personal attributes including demonstrating empathy, respect and compassion. Joubert et al. (2006) described these subtle personal interactions as 'soft skills,' (Joubert et al. 2006: p. 28).

Teaching skills. The important teaching skills identified were the importance of establishing rapport with learners; creating a positive, supportive educational environment; developing

specific teaching methods; and being committed to the growth of learners (Althouse et al. 1999; Wright & Carrese 2002; Lombarts et al. 2010). Having greater assigned teaching responsibilities was strongly associated with being identified as an excellent role model (Wright et al. 1998). The importance of providing students with plenty of patient interaction in clinical settings was emphasised (Althouse et al. 1999; Cote & Leclere 2000; Elzubeir & Rizk 2001). Wright (2002) highlighted that it is important that doctor role models ensure a *role modelling consciousness* in that they specifically think about being role models when interacting with patients in the presence of learners (Wright & Carrese 2002: p. 641).

Personal qualities. The distinct personal qualities of role models included having effective interpersonal skills; a positive outlook; integrity; good leadership skills; and a commitment to excellence (Wright & Carrese 2001, 2002). Being dedicated, honest, polite, enthusiastic (Elzubeir & Rizk 2001) and inspiring students (Joubert et al. 2006) were also important attributes.

Theme 2: The personality profiles of positive role models

Two USA studies investigated the personality profiles of positive doctor role models (Magee & Hojat 1998; Hojat et al. 1999). In the first study, participants were a national sample of 188 physicians nominated by the chief executive officers of their institutions as positive role models and who had completed the NEO Personality Inventory. Compared with the general population, the positive role models scored higher on conscientiousness, achievement striving, competence, dutifulness, trust and assertiveness.

The second study found that doctor role models have certain attributes that distinguish them not only from the general public but also from physicians in training. The role models were more willing to cooperative and more eager to contribute to resolving problems. In addition, doctor role models were better able to control impulses, cope with stressful situations and were less anxious and hostile (Hojat et al. 1999). In summary, both studies highlight important attributes of successful team leaders. The authors concluded that internal medicine residents and role models had distinct personality profiles.

Theme 3: The influence of positive role models on students' career choice

The literature highlighted the influence of role models on students' career choice in undergraduate and postgraduate education (Henderson et al. 1996; Ambrozy et al. 1997; Watts et al. 1998; Basco & Reigart 2001; Ravindra & Fitzgerald 2011). In undergraduate education, many medical students had identified their career influencing role models by the time of graduation (Henderson et al. 1996; Basco & Reigart 2001). In postgraduate education, career influencing role models were identified as those who encouraged active participation and taught advanced skills (Watts et al. 1998; Ravindra & Fitzgerald 2011). Interestingly, role models do not always intentionally try to recruit students to join their specialties but shared a belief that demonstrating enthusiasm, dedication and sincere love of their work, is an important influence on student choice (Ambrozy et al.1997).

Theme 4: The process of positive doctor role modelling

Four papers focused on the process of doctor role modelling (Balmer et al. 2007; Taylor et al. 2009; Park et al. 2010; Curry et al. 2011). Park et al. (2010) emphasised a three stage process of observation, reflection and reinforcement as playing a key role in their learning from positive role models. Balmer et al. (2007) highlighted role modelling as being effective when used as an intentional learning process linked to clinical practice in which teachers explicitly describe and explain their behaviours and clinical decisions.

However, role modelling can be more informal and unplanned when students learn from the direct observation of skilled doctors (Taylor et al. 2009). Curry et al. (2011) systematically documented the type of exemplary behaviours reported by medical students when observing health care teams on an anaesthesia rotation in the operating room. The authors concluded that medical students reported observing very positive, exemplary health care provider interactions. The students identified how the modelled behaviours of calmness, good communication skills, and comforting approaches impacted on the professionals' interactions with patients; as did their team-working skills and respectful attitudes on their interactions with colleagues; and their teaching skills on their interactions with medical students.

Theme 5: The influence of negative doctor role modelling

Three papers focused on the influence of negative doctor role modelling (Murakami et al. 2009; Wear et al. 2009; White et al. 2009). Negative modelling occurred most commonly in the informal and hidden curriculum (Murakami et al. 2009). Wear et al. (2009) studied medical students' perceptions of the use of derogatory humour in clinical settings. The students were disappointed by role models displaying derogatory humour and were aware that they should not imitate this behaviour. The authors suggested the need for a more critical, open discussion of these attitudes and more vigorous attention to faculty development for clinical teachers. Murakami et al. (2009) conducted a similar study in Japan and described how negative role modelling in the hidden curriculum adversely affects professional behaviours and the career choice of trainees. Examples of negative modelling in this article include student descriptions of the persistence of hierarchy and exclusivity by senior doctors, the existence of gender issues, and senior staff members criticising departments and institutions.

Similar findings were revealed in a narrative exploration of how conflict between the formal and informal curriculum influences student values and behaviours (White et al. 2009). The results indicated that medical students experienced strong feelings of powerlessness and conflict during clerkships between what they had learned about patient centred care in

the first two years and what they saw modelled in the third year. Based on the students' comments, the authors categorised students into one of three groups: those whose patient centred values were maintained, compromised or transformed. Therefore, role modelling had a significant influence on the development of students' patient centred values.

Summary of the medium scoring papers

There are 11 medium scoring papers. From these, three themes similar to those of the high scoring papers were identified, namely the attributes of positive role models (Matthews 2000; McLean 2006; Yazigi et al. 2006; Lynoe et al. 2008); the influence of positive role models on student career choice (Wright et al. 1997; Drouin et al. 2006; Berman et al. 2008) and the process of positive role modelling (Thiedke et al. 2004). The findings of these studies were consistent with those of the high scoring papers. However, the medium scoring papers highlighted one new theme: the importance of culture, diversity and gender in the choice of role model (Neumayer et al. 1993; Wright and Carrese 2003; McLean 2004a) as summarised below.

Theme 6: The importance of culture, diversity and gender in the choice of role model

McLean (2004a) highlighted culture as a potentially important issue in medical students' choice of role models, especially in a multicultural society with a complex political and social history. The author suggested that identifying with a faculty role model from similar origins may be important for students. The author concluded that early and continuous diversity training for staff and students by appropriate individuals should be a mainstream academic activity to ensure acceptance and appreciation of other cultures.

Wright and Carrese (2003) examined issues related to physicians serving as role models for diverse medical learners with regard to ethnicity, diversity, gender and social class. The authors showed that learners prefer role models similar to themselves and that role modelling is easier when the learner resembles the teacher. The influence of gender in the choice of role model was also highlighted by Neumayer et al. (1993) who studied the importance of female role models in attracting female students to choose a surgical career.

Summary of the low scoring papers

There are three articles in the low scoring category (Jones et al. 2004; McLean 2004b; Shortell & Cook 2008). These papers focused on themes previously identified in high and medium scoring papers; namely the attributes of positive role models (McLean 2004b); the process of positive doctor role modelling (Jones et al. 2004) and the importance of gender in the choice of role model (Shortell & Cook, 2008). The findings were consistent with those identified in both the high and medium scoring categories.

Discussion

Doctor role modelling has been highlighted as an important phenomenon in medical education. To our knowledge, this is the first systematic review of the evidence on role modelling in medical education. The principal strength of our review was the detailed search strategy designed to cover comprehensively all aspects of doctor role modelling. The clear categorisation of the literature into six main themes will be a useful resource for medical educators and stimulate further research on doctor role modelling.

This review has several limitations: First, we recognise the limitations imposed by restricting the inclusion solely to studies reported in English. Second, for the sake of homogeneity, our review only focused on the influence of doctor role modelling and not role modelling by other allied healthcare professionals. Third, our review only researched doctor role modelling for medical students and postgraduate doctors and not any other allied healthcare students.

The evidence from this review provides a consistent picture from across the world of three groups of attributes demonstrated by effective role models – namely high standards of clinical competence, good teaching ability and a set of personal attributes. Our review findings are in concordance with and further enhance the current literature describing the important roles of clinical teachers (Harden & Crosby 2000; Hesketh et al. 2001; Sutkin et al. 2008; Hatem et al. 2011). The attributes of excellent role models identified in our review are similar to those highlighted in several leading discussion articles on role modelling (Paice et al. 2002; Kenny et al. 2003; Cruess et al. 2008; Kahn, 2008). However, while the evidence we have reviewed is strong in terms of clinical competence and teaching ability demonstrated by role models, it is much less convincing when it comes to understanding how personal characteristics (such as personality traits, gender or ethnicity) may impact on role modelling.

Consideration of selection for these identified attributes (at the time of recruitment) is out with the scope of our review. However, being cognisant of the attributes of excellent role models will help medical educators to develop strategies to retain and develop them. The wider evidence in medical education suggests that many of these attributes associated with being excellent role models are related to skills that can be acquired and behaviour that can be modified (Wright et al. 1998). So, by reflecting and improving on these attributes, clinical teachers can enhance their performance as role models (Cruess et al. 2008). This has important implications for institutions in developing their clinical teachers.

Most importantly, by demonstrating these important attributes in clinical practice, role modelling remains a very important method of transmitting the components of medical professionalism. The evidence from this review alludes to positive role modelling as an effective strategy for the development of medical professionalism in learners. As the teaching of professionalism is highly context dependent, doctor role modelling is potentially key to the development of high standards of professionalism in medical education (Passi et al. 2010). This is important as there are currently no evidence based guidelines for the teaching of professionalism

whilst there is much on-going debate worldwide regarding the most effective teaching methods in developing professionalism (Steinert et al. 2005; Cohen 2006; Cruess & Cruess 2006; Brater 2007; Buyx et al. 2008; Goldie 2008; Morrison 2008; Passi et al. 2010). Similarly, there is currently no consensus amongst educators regarding the best method of assessing professionalism (Arnold 2002; Lynch et al. 2004; Veloski et al. 2005; Parker 2006; Jha et al. 2007).

The second important impact of positive role models is the influence on the career choices made by students. This influence can be active wherein teachers engage and involve students in their particular clinical settings or the influence may be more passive – often by demonstrating their passion for their work. To this end, clinical teachers must be aware of their impact on the recruitment and retention of learners into all medical specialities. This impact by role models is vital – as the choice of medical specialities is complex and current evidence indicates that students' decisions change at different stages of undergraduate and postgraduate training (Lambert et al. 2003; Taylor et al. 2009; Goldacre et al. 2010).

Most of the literature in this review has focused on the influences of positive role modelling. However, within medical circles, negative role models are known to be a strong influence and their negative impact can have a profound effect on the professional behaviours of learners. The limited high-quality evidence available in this area highlighted that it tended to occur in the informal and hidden aspects of the curriculum and created a conflict for students with regard to what has been taught in the formal curriculum and what is observed in the informal curriculum. The evidence from this review does not highlight any specific methods to reduce the impact of negative role modelling. Other leading discussion articles similarly indicate that negative modelling still poses a huge challenge for medical educators worldwide in the 21st century (Hafferty & Franks 1994; Paice et al. 2002; Cruess et al. 2008). Therefore, the influence of negative role modelling requires deeper exploration and research to identify ways to mitigate this effect.

While the influences of both positive and negative role modelling are clearly described in this review, the actual process of learning from role models is still poorly understood. Role modelling can occur as an intentional learning process (Balmer et al. 2007) in which the clinical teachers explicitly describe their behaviours or it can be informal, unplanned, and occurs at any time (Taylor et al. 2009). Our review findings are consistent with Bandura's social learning theory which states that people learn from one another via observation, imitation and modelling (Bandura 1977). However, if we are to maximise the potential of role modelling, we need to understand in much more detail both the conscious and explicit processes doctor role models use as well as what happens when physicians are modelling unconsciously in their roles. Finally, a crucial initial step in enhancing role modelling is for clinical teachers to adopt a conscious awareness of role modelling in all clinical environments. Role modelling, like other interpersonal interactions can be defined as a competence (Bochner & Kelly 1974). Consciousness is an important stage in the transition from unconscious incompetence to conscious competence (Adams 2011). Thus, it seems that there is rich potential in helping clinical teachers to become aware of their modelling and developing their skills to become more effective role models.

Conclusions

This systematic review highlights role modelling as an important process for the professional development of learners. Excellence in role modelling involves demonstration of high standards of clinical care, excellent teaching skills and a distinct set of personal qualities. Positive role models not only help to shape the professional development of our future physicians, they also influence their career choices. However, the negative effects of role models who fail to meet acceptable professional standards can be equally strong and educators need to consider methods to reduce this effect. Based on the findings on this review, we suggest the following recommendations for clinical practice and future research.

Recommendations for clinical practice

- Clinical teachers can enhance their status as role models. To be an effective role model, clinical teachers must be encouraged to develop a conscious awareness of role modelling, in which they specifically think about being role models when interacting with learners. Role modelling should be explicit in clinical teaching, as it is important for teachers to make an intentional effort to articulate what aspects they are modelling.
- Clinical teachers need to be aware of the profound influence they exert on recruitment to specialities and that the level of enthusiasm they display for their job is a compelling factor.
- Medical leaders need to develop strategies to ensure the organisational structure supports a culture of excellence in doctor role modelling. This will involve developing innovative faculty development initiatives and may require establishing valid methods of evaluating the performance of faculty in addition to the provision of opportunities for self-improvement through faculty development.
- Medical educators worldwide need to collaborate and share ideas to develop excellence in role modelling; as this in turn will ensure high standards of patient care.

Recommendations for future research

- An immediate priority is to evaluate methods of developing a conscious awareness of role modelling and enhancing competence in role modelling.
- The literature draws attention to negative role modelling and further research is required to untangle the positive-negative role model interface as well as to better understand the impact of negative role modelling and develop approaches to reduce its more pernicious side.
- The process of role modelling is not fully understood and future research is required to understand the complex process of how positive role modelling influences the behaviours and career choices of future doctors.
- Research is required to investigate the relative strengths of role modelling when compared with more traditional approaches to teaching.
- Future research should focus on the association between culture, diversity and gender in the choice of role models as this may have implications for the recruitment of medical teachers/faculty.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

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Appendix 1. Search strategy.

Table A1. Search strategy.

Database	Search Strategy
PubMed	((''physicians"[MeSH Terms] OR ''physicians"[All Fields] OR ''doctor"[All Fields]) OR ''physician"[All Fields])) AND (role model[All Fields] OR role modeled[All Fields] OR role modeling[All Fields] OR role modelled[All Fields] OR role modelling[All Fields] OR role models[All Fields]) AND (''education, medical"[MeSH Terms] OR (''education"[All Fields] AND ''medical"[All Fields]) OR ''medical education"[All Fields] OR (''medical"[All Fields] AND ''education"[All Fields]))
Embase	1 role model*.mp. 2 role.mp. 3 model.mp. 4 2 and 3 5 1 or 4 6 medical education.mp. or exp medical education/ 7 doctor.mp. or physician/ 8 5 and 6 and 7
PsycInfo	all(role model* OR (role AND model*)) AND all(doctor* OR physician*) AND all(medical education)
Education Research Complete	(role model* or (role and model*)) AND (doctor* or physician*) AND medical education
Web of Knowledge	Title = (role model* or (role and model*)) AND Topic = (doctor* or physician*) AND Topic = (medical education)
ERIC	all(role model* OR (role AND model*)) AND all(doctor* OR physician*) AND all(medical education)
British Education Index	(role model* OR (role AND model*)) AND (doctor* OR physician*) AND (medical education)

Appendix 2. BEME data extraction sheet.

Section 1. Administrative

Reviewer
Authors
Title
Year
University, Country

Section 2. Summary of papers according to quality indicators (details below).

Quality Indicator	Score = 0 or 1	Summary
Total Score = /11		
1. Research Question		
2. Study Subjects		
3. Data Collection Methods		
4. Completeness of Data		
5. Control of Confounding		
6. Analysis of Results		
7. Conclusions		
8. Reproducibility		
9. Prospective		
10. Ethical Issues		
11. Triangulation		

Section 3. Documented Influences of Doctor Role Modelling

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Section 4. Any other comments regarding the article

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BEME scoring taken from BEME review on E-Portfolios

Quality indicators for all studies. Quality indicators against which all studies were assessed are given, together with clarification of meaning in each case.

Quality assessment of studies. To assess the quality of included studies, a series of 11 quality 'indicators' was developed. These related to the appropriateness of the study design, conduct, results analysis and conclusions. Higher quality studies were considered to be those which met a minimum of 8 of these 11 indicators.

Quality Indicator Detail.

(1) Research question: Is the research question(s) or hypothesis clearly stated?
(2) Study subjects: Is the subject group appropriate for the study being carried out (number, characteristics, selection, and homogeneity)?
(3) 'Data' collection methods: Are the methods used (qualitative or quantitative) reliable and valid for the research question and context?
(4) Completeness of 'data': Have subjects dropped out? Is the attrition rate less than 50%? For questionnaire based studies, is the response rate acceptable (60% or above)?
(5) Control for confounding: Have multiple factors/variables been removed or accounted for where possible?
(6) Analysis of results: Are the statistical or other methods of results analysis used appropriate?
(7) Conclusions: Is it clear that the data justify the conclusions drawn?
(8) Reproducibility: Could the study be repeated by other researchers?
(9) Prospective: Does the study look forwards in time (prospective) rather than backwards (retrospective)?
(10) Ethical issues: Were all relevant ethical issues addressed?
(11) Triangulation: Were results supported by data from more than one source?

Table A2. Summary table of included papers.

Author; Title	Aim	Year	Country	Method	Results	Conclusions	Theme	Score
Althouse et al. Attitudes and approaches of influential role models in clinical education.	To determine the characteristics and teaching methods associated with positive role modelling.	1999	USA	Semi structured interviews with 10 role models. 4 role models observed.	5 themes emerged: role models approaches to their teaching; their attitudes towards teaching and learning; clinical competence; external roles and general affect.	Role models were attentive to the needs of students and adapted their teaching accordingly. They provided plenty of patient interaction and demonstrated the rewards of being a physician. Quality more important than quantity.	1	8
Ambrozy et al. Role models' perceptions of themselves and their influence on students' speciality choices.	To examine the perceptions of the faculty role models and to learn if their perceptions of role models' behaviours are congruent with those of their students.	1997	USA	Mailed questionnaire to 210 student identified role models.	177/210 response = 84%. The role models agreed with the students about what it is important to model.	Role models did not intentionally try to recruit students but felt that demonstrating enthusiasm and a sincere love for what they did has a strong influence. The role models agreed with their students what is important to model.	3	8
Balmer et al. Learning behind the scenes: Perceptions and observations of role modelling in paediatric community clinic.	To analyse what and how paediatric residents learn through role modelling during their continuity experience.	2007	USA	Interviews and observations with 10 residents and 10 faculty.	Role modelling was an implicit and intentional learning strategy.	Role modelling is a deliberate learning strategy. Need clarification of definitions.	4	8
Basco & Reigert. When do medical students identify career-influencing physician role models?	To identify when med students gain physician role models relative to when they make speciality choices.	2001	USA	Questionnaire survey to Medical Students.	89/144 = 62% response rate. Most students met role models from third year.	Most medical students have physician role models at graduation, with most identified in 3rd year before making speciality choice.	3	9
Berman et al. Attracting surgical clerks to surgical careers: role models, mentoring and engagement in the Operating Room	To identify those aspects of the surgical clerkship that are associated with medical students' experiencing an interest in surgery.	2008	USA	Online questionnaire survey to 131 medical students.	116/131 = 89% response. Students who have positive role models and participate actively in operations will consider surgery as option.	It is important to encourage meaningful and active involvement of students.	3	7
Cote & Leclere. How clinical teachers perceive the doctor – patient relationship and themselves as role models.	To describe how clinicians who teach clerks and residents represent the doctor – patient relationship and how they see themselves as role models for this relationship.	2000	Canada	Semi structured interviews with 28 clinical teachers.	Most of the teachers had difficulty in describing behaviours or situations in which they modelled the doctor-patient relationship.	Being a role model requires a fairly precise idea of what one is modelling and what one wants the trainee to understand about the relationship.	1	8
Curry et al. Role modelling in the operating room: medical student observations of exemplary behaviour.	The aim of this research was to determine and thematically define the exemplary professional behaviours that med students observe in the operating room.	2011	USA	286 medical students recorded one exemplary and one lapse in operating room.	Themes were interaction with patient (calm, communication, comforting); with one another (teamwork, respect); and with medical students (teaching).	This classification of exemplary behaviours contributes to our understanding of how professional behaviour is viewed and potentially emulated by medical students.	4	8
Drouin et al. Medical students as teachers and role models for their future colleagues	The authors describe the role of junior medical students in recruitment.	2006	Canada	The medical students designed workshops. Evaluation is by questionnaire, focus groups and admission statistics.	Attendees give positive evaluations highlighting the importance of role modelling.	Allowing junior doctors to act as teachers and role models for high school and university students during recruitment activity can be useful strategy for institutions.	3	6

Elzubeir & Rizk. Identifying the characteristics that students, interns and residents look for in their role models.	To identify the characteristics that students, interns and residents look for in their role models.	2001	UAE	Questionnaire was sent to medical students, interns and residents.	*N* = 96, response rate = 80% Personality, teaching and clinical skills were the top three factors identified.	Knowing the characteristics of excellent role models should help medical educators to formulate strategies to recruit, retain and develop them.	1	8
Henderson et al. General internists influence students to choose primary care careers: the power of role modelling.	To determine whether med students supervised by general internists are more likely to choose primary care careers.	1996	USA	Questionnaire survey to Medical Students pre and post clerkships and at graduation.	Both pre and post clerkship questionnaires were completed by 138/144 = 96%. Graduation survey completed by 137/188 = 73%	Role modelling appears important in choosing general internist medicine.	3	9
Hojat et al. A comparison of the personality profiles of internal medicine residents, physician role models and the general population.	To compare personality profiles of internal medicine residents with those of the general population and positive role models in medicine.	1999	USA	Neo Personality Inventory to 104 residents and 188 role models.	The internal medicine residents were more likely to be attentive, to have deeper curiosity, higher aspirations and be more receptive to emotions. Medical residents were less eager to face challenges, less able to control their impulses, less able to cope with adversity, less relaxed and less easy going.	Understanding the more distinct qualities of successful physicians helpful in career counselling of students and young physicians.	2	8
Jones et al. An intentional modelling process to teach professional behaviours: Students' Clinical Observations Of Preceptors	The authors describe an innovative process called SCOOP.	2004	USA	The authors describe the SCOOP process. 93 med students completed at least 1 SCOOP.	83% of students found SCOOP a positive experience for modelling professionalism	The SCOOP provides explicit framework to optimise modelling of professionalism.	4	5
Joubert et al. Medical students on the value of role models for developing 'soft skills' – 'that's the way you do it.'	To study the importance that medical students attach to role models in the development of soft skills.	2006	Africa	91 medical students. Interviews and focus groups.	The students idea of a good role model was a clinically and academically competent doctor that cared about patients, had good interpersonal skills and who could inspire students.	Medical schools need to be consciously aware of the importance of positive and negative role models. Students needed role models to develop own soft skills.	1	8
Lombarts et al. Good clinical teachers likely to be specialist role models.	To examine whether teaching qualities of faculty were associated with their being seen as specialist role models.	2010	Holland	Questionnaire survey to 549 residents of 36 teaching programmes in 15 hospitals.	407 residents completed. 4123 evaluations of 662 faculty = 71% response rate.	Top 3 qualities were –those that rated highly on feedback; a professional attitude towards residents and creating a positive learning climate. Good clinical educators more likely to be seen as specialist role models.	1	8
Lynoe et al. Teaching medical ethics: what is the impact of role models?	The aim of the study was to elucidate what influences medical students' attitudes and interest in medical ethics.	2007	Sweden	Questionnaire to 409 medical students from 6 schools.	Average response rate 36%.	An increased interest in medical ethics is mainly by encountering good role models in medical school.	1	6
Magee & Hojat. Personality profiles of male and female positive role models in medicine.	To investigate the personality profiles of positive role models in medicine in comparison to the general population.	1998	USA	188 physician role models nominated by CEO completed the NEO Personality Inventory.	188 = 80% response. 164 men 24 women.	Role models scored higher on conscientiousness factor, achievement striving, activity, competence, dutifulness, trust, assertiveness versus the general population.	2	9
Mathews. Role modelling: how does it influence teaching in family medicine?	To explore the influence of role modelling on teaching in family medicine.	2000	S.Arabia	9 semi structured interviews with faculty. Questionnaire to 28 residents.	27/28 response = 97%. 4 remembered teacher behaviours described.	Agreement between faculty and residents with regard to the important aspects to model.	1	6

(continued)

Table A2. Continued.

Author; Title	Aim	Year	Country	Method	Results	Conclusions	Theme	Score
McLean. Is culture important in the choice of role models?	To investigate the importance that students' ascribe to culture in their choice of role model.	2004a	Africa	Questionnaire to medical students.	No response rate given. 40.7% felt culture was important in the choice of a role model.	The need for staff training in culture, diversity and tolerance. Cultural diversity training is important in curriculum.	6	6
Mclean. The choice of role models by students at a culturally diverse South African School	The objectives of the study were to ascertain where students sought role models and the characteristic of the role models.	2004b	Africa	Questionnaire to 824 medical students	Response = 97.5%. 64% of students considered having a role model important.	The findings are considered in the light of global medical training and the need for faculties to provide appropriate role models for students.	1	5
McLean. Clinical role models are important in the early years of PBL curriculum.	The study compares the role models identifie by students in the first 2 years of the traditional medical curriculum with that of a PBL programme.	2006	Africa	Questionnaire study to 745 medical students.	90% response rate. PBL students more likely to identify role models.	Faculty need to be aware that they are being assessed as role models and their behaviours must be worthy of emulation at all times. Need exposure to role models in early years.	1	6
Murakami et al. The perception of the hidden curriculum on medical education: an exploratory study	To identify themes pertaining to the students' perceptions of the hidden curriculum.	2009	Japan	Semi structured interviews with 25 medical students	Seven themes including the prevalence of positive and negative role models.	Some effects of the hidden curriculum likely to exist in Japan and UK despite the differences in their demographic backgrounds, cultures and philosophies.	5	8
Neumayer et al. Female surgeons in the 1990s: academic role models	A survey of female surgeons and their role models.	1993	USA	Questionnaire to 1500 members of the association of female surgeons.	676/1500 = 45% response. 630 believed that female medical students need successful female surgeons as role models.	Need successful female surgeons as role models.	6	6
Park et al. Observation, reflection and reinforcement: faculty members' and residents' perceptions.	To explore perceptions of how professionalism is learned in the current academic climate.	2010	Canada	34 semi structured interviews with surgery residents and faculty at 2 institutions.	Participants identified 3 processes - observation, reflection and reinforcement in learning from role models. Role models the most important source of learning professionalism.	This study highlights an active approach to role modelling through intentional and explicit demonstration of behaviours.	4	9
Ravindra & Fitzgerald. Defining surgical role models and their influence on career choice.	To investigate whether identifying role models in surgery influences career choice.	2011	UK	Questionnaire to 320 graduates.	208/320 = 65% response. 131 = 63% were able to identify a role model.	Junior doctors were twice as likely to pursue a surgical career if they identified a positive surgical role model.	3	8
Shortell & Cook. Importance of gender specific role models in vascular surgery	To explore the importance of same gender role models in vascular surgery.	2008	USA	Questionnaire survey to 2389 members of the Society of Vascular Surgeons.	135 respondents = 5.6%. Men and women more likely to find male role models in Medical School.	Lack of female role models during medical school.	6	4
Taylor et al. The influence of mentorship and role modelling on developing physician-leaders	To understand the role and functions of role modelling in developing leaders.	2009	USA	Semi structured interviews with 25 faculty.	3 themes identified: role modelling is different to mentoring; the importance of strategic interactions; emotional support.	Role modelling is different to mentoring and there is an impact of learning from direct observation of leaders.	4	8
Thiedke et al. Students' observations and ratings of preceptor's interactions with patients: the hidden curriculum.	The study examined first year student observations of community based physician behaviour during a community based clinical experience.	2004	USA	1st year medical student questionnaire regarding physicians' behaviour with patients.	119 = 87% response rate. Students rated aspects of the physicians demeanour with patients as the highest value.	Community based physicians reinforce many professional values associated with positive role modelling aspects of the physician – patient interaction.	4	7

Watts et al. Undergraduate education in anaesthesia: the influence of role models on skills learnt and career	To investigate the influence of role models on the educational process of anesthetic teaching to undegraduates.	1998	Australia	Questionnaire to 75 directors. Questionnaire to 160 final year medical students.	40/75 faculty response. 101/160 student response. Positive role models were identified by 66% students if they and practical training.	For those students intending a career in anaesthesia (18%); 94% identified a positive role model compared to 65% who did not ($P = 0.03$).	3	8
Wear et al. Making fun of patients: medical students' perceptions of the use of derogatory and cynical humour.	To investigate how medical students perceive and use derogatory and cynical humour directed at patients.	2006	USA	5 focus groups with 58 medical students.	5 categories emerged: ''Fair game'' patients; locations; ''Humour game''; not funny humour; motives. Students disappointed by role models displaying derogatory humour. Intergenerational Transmission Model.	Need to use positive role modelling as a specific strategy to develop professionalism. Consider – ''Reflections on Doctoring'' classes.	5	8
Weismann et al. Role modelling humanistic behaviour: learning bedside manner from experts.	To study how excellent teachers impart the behaviours and attitudes consistent with humanistic care to their learners.	2006	USA	12 faculty role models. Observations and interviews.	Clinical teachers taught by role modelling. The teachers identified self-reflection as the method by which they refined their teaching strategies.	Role modelling is the primary method by which excellent clinical teachers try to teach medical residents humanistic aspects of medical care.	1	9
White et al. A qualitative exploration of how the conflict between the formal and informal curriculum influence students values and behaviours	Exploration of the FCE on students' experiences in the third year clinical clerkship.	2009	USA	Focus groups with 27 3rd year med students.	Authors categorised students into those whose patient centred values were maintained, compromised or transformed.	Role modelling had a significant influence on consequences related to students' patient centred values.	5	8
Wright. Examining what residents look for in their role models.	The study aims to determine which characteristics were considered most important by residents regarding their physician role models.	1996	USA	Questionnaire to 195 residents.	195/230 = 85% response. 144 = 74% satisfied with proportion of positive role models. Clinical skills, personality and teaching ability were rated as 3 most important factors.	Knowing what residents look for in their role models should help identify which staff are excellent role models and these staff should be selected as role models.	1	8
Wright et al. The impact of role models on medical students	To explore the relationship between exposure to clinical role models during medical school and the students choice of clinical field for residency training.	1997	USA	Questionnaire to medical students	136/146 graduating students. 90% had identified role model at medical school.	Exposure to role model in clinical field is strongly associated with medical students' choice in residency.	2	7
Wright et al. Attributes of excellent attending physician role models.	Case control study To identify attributes of excellent attending physician role models.	1998	USA	Case control study. Questionnaire sent to role models and non-role models	341/411 response = 83% Of these 144 = 42% identified as excellent role models Having greater assigned teaching responsibility was important as role model.	Many of the attributes of being an excellent role model are related to skills that can be acquired and to modifiable behaviour.	1	9
Wright & Carrese. Which values do attending physician try to pass on to house officers?	To determine the values and attitudes which attending physicians try to pass on to residents.	2001	USA	Questionnaire study to 41 physicians at 4 universities.	341/411 response = 83% 265 (78%) shared the single value they would pass on. 4 main categories identified: Caring, Respect, Communication, Integrity.	Attending physicians attempt to pass on values and attitudes that they consider important for the professional development of medical trainees.	1	9
Wright & Carrese. Excellence in role modelling: insight and perspectives from the pros	To better understand role modelling by examining the insights of physician role models.	2002	USA	Semi structured interviews with 29 role models identified by house staff.	Categories of identified teaching and personal qualities given for role models. Barriers described. Multiple role models valued	Role Model Consciousness. Highly regarded physicians have personal qualities, teaching abilities and exceptional clinical skills that can be modified and/or acquired. Role modelling is implicit.	1	8

(continued)

Table A2. Continued.

Author; Title	Aim	Year	Country	Method	Results	Conclusions	Theme	Score
Wright & Carrese. Serving as a Physician role model for diverse population of learners.	The study examined issues related to physicians serving as role models for diverse medical learners.	2003	USA	Semi structured interview with 29 role models.	3 domains identified in the results. Learners prefer role models similar to themselves and role modelling is easier in this situation.	Physicians need to consider a broader range of options for successful interactions with learners different to them.	6	7
Wyber & Egan. For better or worse: role models for New Zealand House Officers	This study examines the positive and negative role modelling experiences of the house officers.	2007	NZ	Semi structured interviews with 12 GPs and 13 house officers.	Relationship of house officer and their role model; relationship of role model and patients; relationship of role model and medicine.	Role modelling is an interactional, transactional process which occurs simultaneously with multiple models and changes over time.	1	8
Yazigi et al. Clinical teachers as role models: perceptions of interns and residents in a Lebanese medical school.	To identify the characteristics and learning impact of role models as perceived by interns and residents.	2006	Lebanon	Questionnaire sent 34 interns and 66 residents.	88 (97%) had positive role models and 87 (96%) had negative role models. Role modelling had positive impact on achievement of improved clinical skills (55%) and humanistic skills (30%).	Role models have a positive impact on the professional learning and career choices of interns and residents. Strategies to reinforce role modelling are required to pass on broad spectrum of professional values to students.	1	7