

## Professional identity in clinician-scientists: brokers between care and science

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**CONTEXT** Despite increasing numbers of publications, science often fails to significantly improve patient care. Clinician-scientists, professionals who combine care and research activities, play an important role in helping to solve this problem. However, despite the ascribed advantages of connecting scientific knowledge and inquiry with health care, clinician-scientists are scarce, especially amongst non-physicians. The education of clinician-scientists can be complex because they must form professional identities at the intersection of care and research. The successful education of clinician-scientists requires insight into how these professionals view their professional identity and how they combine distinct practices.

**OBJECTIVES** This study sought to investigate how recently trained nurse- and physiotherapist-scientists perceive their professional identities and experience the crossing of boundaries between care and research.

**METHODS** Semi-structured interviews were conducted with 14 nurse- and physiotherapist-scientists at 1 year after they had completed MSc research training. Interviews were thematically analysed

using insights from the theoretical frameworks of dialogical self theory and boundary crossing.

**RESULTS** After research training, the initial professional identity, of clinician, remained important for novice clinician-scientists, whereas the scientist identity was experienced as additional and complementary. A meta-identity as broker, referred to as a 'bridge builder', seemed to mediate competing demands or tensions between the two positions. Obtaining and maintaining a dual work position were experienced as logistically demanding; nevertheless, it was considered beneficial for crossing the boundaries between care and research because it led to reflection on the health profession, knowledge integration, inquiry and innovation in care, improved data collection, and research with a focus on clinical applicability.

**CONCLUSIONS** Novice clinician-scientists experience dual professional identities as care providers and scientists. The meta-position of being a broker who connects care and research is seen as core to the unique clinician-scientist identity. To develop this role, identity formation and boundary-crossing competencies merit explicit attention within clinician-scientist programmes.

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## INTRODUCTION

As the number of medical and health science publications doubles roughly every 9 years, the body of scientific knowledge is growing steadily.<sup>1</sup> The importance of integrating this scientific knowledge into the care of patients or prevention programmes is widely recognised. To improve health care, large institutes, such as the National Institutes of Health (NIH), have invested increasingly in medical research; however, these investments have not yet led to corresponding increases in new treatments or cures.<sup>2,3</sup> There is a need for clinician-scientists, professionals who feel at home in both worlds, to help link science and care. Clinician-scientists can help to connect these worlds by signalling and addressing clinically relevant research questions and by translating research findings into clinical practice.<sup>4-9</sup> Although the value of clinician-scientists is recognised, the relative number of physicians involved in science has steadily decreased over the last decades,<sup>5,10,11</sup> and participation in research is even more scarce among non-physician clinicians such as nurses, dentists and allied health professionals.<sup>6,12,13</sup> International concern about the shortage of clinician-scientists has led to increased interest in improving educational and career support programmes.<sup>14-16</sup>

The position of the clinician-scientist is challenging because tasks in science and care compete for time, which makes it difficult to achieve outputs comparable with those of colleagues who work full-time in either field. Moreover, science and care represent different professional practices, each of which has its own organisational structure, socio-cultural environment, and demands for professional competence and performance.<sup>7,17,18</sup> For instance, in the care context, clinicians are judged on their clinical expertise, production and patient satisfaction, whereas in the science context, numbers of publications and their impact factors are crucial to an individual's possibilities for research funding and career.<sup>17</sup> Although the clinical relevance of research is increasingly thought of as being important, its measurement is difficult and it is therefore scarcely reflected in the reward system. Because of these different value systems, people may feel a constant pressure to focus on one task only.<sup>18</sup> Adapting to new roles, such as is required in the transition from clinician to clinician-scientist, requires the development of a new professional identity.<sup>19</sup> Stimulating an integrated clinician-scientist identity may be key to creating resilience in maintaining a career across the fields of both science and care.<sup>17,18,20</sup> By identifying with the unique

combination of disciplines and recognising the advantages of doing so, clinician-scientists may be motivated to overcome the hurdles in their educational and career pathways. However, the formation of an integrated professional identity is not self-evident; clinical training usually precedes and is often taught separately from research training.<sup>9</sup> Although one's professional identity is likely to be important, little is known about how clinician-scientists perceive their professional identities.<sup>17</sup> Does a unique clinician-scientist identity exist? Do clinician-scientists perceive singular or plural professional identities? Conceptual understanding of a professional identity allows for the development of educational strategies that support its formation.<sup>21</sup> However, a literature review indicated that higher education programmes often lack a clearly articulated understanding of the intended professional identity formation to inform education.<sup>22</sup> This study sought to address this gap with regard to nurses and physiotherapists recently trained as clinician-scientists.

To understand professional identity formation in clinician-scientists, we draw upon dialogical self theory (DST).<sup>23</sup> This framework considers the 'self' as a dynamic configuration of multiple identity positions (e.g. 'I as a parent, as a lover of art, as a teacher') from which to act. The self is shaped by both internal dialogues between identity positions (e.g. 'As a parent I want to provide help' versus 'As a teacher I want my child to seek his or her own solution') and external dialogues with other people (e.g. 'Receiving appreciation from patients motivates me to continue my clinical career'). The image of the self is the result of a continuous process of narrative construction during which identity positions can be redefined, added, removed, merged and so on, providing the possibility to further develop and renew the self whilst maintaining a sense of unity. This narrative is of particular importance when individuals operate in different contexts.<sup>24</sup> By explicitly addressing the multifaceted nature of identity and incorporating the relationship with the external world (e.g. professional contexts), this framework is well suited to the study of professional identity in interprofessional careers such as those of the clinician-scientist. Despite our use of the DST perspective, we will refer to identities rather than identity positions to improve the readability of this paper.

Clinician-scientists move between two professional practices and are expected to work at the intersection of these epistemologically, socially and culturally different contexts. The theory of boundary crossing

might provide insight into how clinician-scientists combine distinct practices. Several learning mechanisms that can occur as a consequence of crossing the boundaries between groups, systems or cultures have been described: *reflection* (which can stimulate a helicopter view and lead to the making and taking of new perspectives); *identification* (which can stimulate a new appreciation of people's existing practices and strengthen feelings of belonging with regard to these practices); *coordination* (which can lead to the development of new procedures for alignment and effective collaboration between practices), and *transformation* (which can lead to innovations and integrations of various practices).<sup>25</sup> Boundary crossing can take place at the institutional level (e.g. strategic partnerships), the interpersonal level when professionals from different contexts (e.g. disciplines or organisations) collaborate (e.g. in interprofessional learning wards), or the intrapersonal level when individuals participate in two or more professional practices simultaneously.<sup>26</sup> The latter level includes clinician-scientists who are involved in both health care and scientific practice. From the perspective of boundary crossing, a person situated at the boundary of two practices is typically considered as a broker, a significant yet challenging position from which connections between contexts can be made.

Improving the education of clinician-scientists and optimally preparing them for dual careers requires insight into how clinician-scientists perceive their professional identity and navigate the different demands and organisational contexts of care and science. The effects of boundary crossing are likely to be experienced most consciously in novice clinician-scientists because they have only recently been confronted with different practices. Because the shortages in the clinician-scientist workforce are greatest with respect to non-physician clinician-scientists, we decided to study nurse- and physiotherapist-scientists. Specifically, our study explored how recently trained nurse- and physiotherapist-scientists perceive their professional identities and work across the boundaries of science and care.

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## METHODS

### Educational setting

Our study was conducted among first-year alumni of the clinician-scientist programme Clinical Health Sciences (CHS) (in Dutch: *Klinische Gezondheidswetenschappen*) of Utrecht University, Utrecht, the Netherlands. This programme is targeted at nurses and

physiotherapists and aims to complement prior clinician training with academic and research skills. The CHS educational programme consists of a 1-year, part-time pre-Master's programme, followed by a 2-year, part-time Master of Science (MSc) programme. Two programme specialisations are offered in, respectively, nursing science and physiotherapy science. The study load amounts to 20 hours per week, and students continue to work as health care clinicians throughout the programme. After graduating, alumni enter academic positions in research (e.g. a quarter of alumni obtain PhDs later in their careers), education, policy and management (e.g. health care innovation and policy, project coordination, managerial tasks), and care.

### Participants

All alumni of the August 2013 CHS graduating class ( $n = 59$ ; eight men, 51 women) were invited to participate in this study. Seventeen of the alumni responded positively and 14 participated in the study. These included 10 nurse-scientists (one man, nine women) and four physiotherapist-scientists (one man, three women). Their average age was 34 years (range: 25–51 years). Selection was based on the diversity of current fields of work (purposeful sampling) in combination with first response date. The predefined target sample size required three to five participants from each of the fields of research, education, policy and management, and patient care. Three candidates were excluded because their field of work was already represented by five participants. Interviews were held during May to November 2014. The low percentage of male participants (14%) corresponds to the gender distribution in the CHS programme and reflects the dominance of women in the health professions field, particularly in nursing. Table 1 shows the participants' self-reported distribution of tasks across work fields. Participants often combined two or more fields. In this table, as well as in quotes throughout this paper, fictitious names are used to enhance readability and to indicate gender.

### Study design

This study sought to develop an understanding of how recently qualified clinician-scientists perceive their identities in relation to their education and field of work, grounded in their experiences. We conducted a phenomenological qualitative study<sup>27</sup> using semi-structured interviews.<sup>28</sup> The use of thematic analysis<sup>29</sup> yielded thick descriptions of participants' perceptions of their professional identity, the

Table 1 Participants' self-reported distribution of current tasks across work fields

Participant*	Distribution of tasks across fields, %†			
	Research	Education	P&M	Care
Mary	20	80	0	0
Gaby	10	10	30	50
Lily	20	80	0	0
David	10	0	20	70
Rosa	50	0	0	50
Julia	100	0	0	0
Oscar	50	0	30	20
Jade	3	0	10	87
Anna	10	9	14	67
Magda	1	1	10	88
Clair	0	10	30	60
Kate	10	0	0	90
Helen	0	0	100	0
Tanja	7	0	53	40

P&M = policy and management.

\* Anonymised.

† In relative greyscale.

factors that influenced the formation of this identity, and the differences and influences they experienced across work fields. During the interviews, participants made timeline drawings<sup>30</sup> to trigger reflection on their changes in identity over time and used different colours when multiple professional identities were mentioned. In addition, participants were asked to reflect on changes in their affinity with health care. A questionnaire was used to collect demographic data.

### Ethical review and accountability

The Ethical Review Board of the Netherlands Association for Medical Education approved this study (NERB no. 346). Informed consent was obtained from all participants. The data were stored in accordance with institutional guidelines. Identifying information was removed from all data before analysis. During the analysis stage, memos were written to generate an audit trail.

### Data analyses

Interviews were digitally recorded and transcribed verbatim. NVivo Version 10.0 (QSR International

Pty Ltd, Melbourne, Vic, Australia) was used to code and analyse the data. The data were analysed using the six-step approach of theoretical thematic analysis,<sup>31</sup> starting with familiarisation (full dataset), initial coding (sample of five interviews) and a search for and review of the themes (full dataset) via a recursive process with regular discussions amongst the members of the research team. Codes were defined and redefined based on discussions within the research team. This procedure led to a set of 20 codes related to two major themes: professional identity, and boundary-crossing experiences. Subsequently, the first two authors used the codes to independently code the full dataset, after which results were described based on the coding.

## RESULTS

### Differences between care and research practices

Participants reported social and cultural differences between care and science practices: whereas care is perceived as team-based, action-oriented, fast, non-flexible and informal, science is perceived as more individualistic, reflective, slow, flexible, intellectually challenging, international, and more formal in its culture and rules (e.g. those related to formal medical ethical approval procedures). One participant articulated the differences as:

[Providing care] is practical and fast paced, and the research atmosphere is contemplative and slow. This requires a lot of patience; that is the biggest difference. (Kate)

Another participant said:

In care you really are part of a team, while in the science field you're more [of] a solitary professional who needs others very much, yet has her own area of responsibility. (Helen)

Another frequently mentioned cultural difference referred to the fact that having differing opinions or being outspoken is not appreciated in care, but is highly valued in academia.

### The professional identity of clinician-scientists

#### *Motives for taking the clinician-scientist pathway*

Apart from some practical reasons (such as required qualification), participants mentioned two major

motives for entering the CHS programme, which were often combined: personal development, and a wish to improve the quality of care.

#### *Dual identity as clinician and scientist*

All participants experienced a dual professional identity rather than a single clinician-scientist identity. Science and care implied different roles with corresponding identities. The scientist identity was experienced as additional to, and separate from, a pre-existing identity as a clinician (i.e. a nurse or physiotherapist):

I feel that being a scientist developed alongside [my clinician identity]. (Oscar)

In other words, participants considered themselves as being both a nurse or physiotherapist and a health scientist. One interviewee described how this dual identity is experienced in daily life as an interplay between internal and external dialogue:

I haven't changed that much, but in my attitude to work I've noticed that when new things are implemented, I will ask what it is based on, whereas before I would just say "OK"... Now I want to know or search the evidence behind it. In that sense I do feel more of a scientist, but in my daily work as a nurse it doesn't matter because my contact with parents and children hasn't changed. This is different in my PhD student appointment, in which I collaborate intensively with the medical team who are much more preoccupied with evidence. In that context I do feel much more [of] a scientist. (Julia)

Participants ( $n = 3$ ) with formal university teaching appointments discussed their role as teacher as representing a third professional identity. Figure 1 depicts an example of a timeline drawing in which Gaby illustrates her experience of a dual professional identity with different developmental trajectories over time.

#### *Being a clinician-scientist: connecting science and care to improve health care*

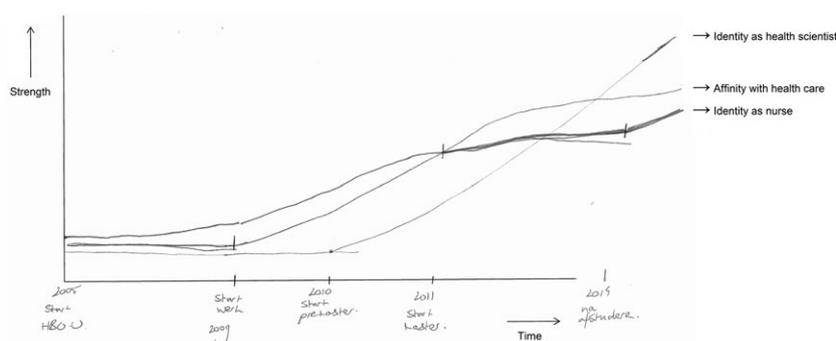
Participants were in strong consensus on three important characteristics that together define clinician-scientists: an overarching view on a health care specialty (nursing or physiotherapy); a critical attitude towards current practice, and advancing the care field by connecting science and care:

Someone who tries to truly connect the two worlds, the practice of nursing and science... I think that is the essence of the nurse-scientist. (Oscar)

The connection between science and care can be achieved in several ways. Care can be improved by creating new ideas and evidence-based innovations, by explaining and communicating evidence, and by formulating and conducting care-informed research to generate new evidence with relevance to clinical practice. All participants considered improving health care as the societal goal of the clinician-scientist; interestingly, however, improvement of the scientific field was not mentioned as a goal *per se*.

Excellent care: that is what you aspire to. (Tanja)

This goal can be achieved through many roles in academia, research, care, teaching or health policy and management as long as these tasks are



**Figure 1** Timeline drawing by Gaby depicting the changes in her professional identity and in her affinity with care. Self-indicated time-points: 2005, starts Bachelor's training in nursing; 2009, graduates and starts working as nurse; 2010, enters the Clinical Health Sciences (CHS) pre-Master's programme; 2011, begins CHS Master's programme (specialising in nursing science); 2013, graduates from CHS and starts working 50/50 as a senior nurse and nursing scientist in an academic hospital

informed by expertise in both health care and science. However, conducting research was commonly mentioned as the most differential task of a clinician-scientist, as preferably combined with an active role as care provider, and always with the intention to translate research findings to practice:

First and foremost they [physiotherapist-scientists] have a role in conducting research and specifically in the area of physiotherapy... then it is nice to have [new knowledge], but the findings also have to be disseminated. Building the bridge in whatever way, via teaching, networking or professional courses. (Jade)

#### *Identity formation in relation to the CHS programme and career development*

Participants described the development of their professional identity as being influenced by research and academic competencies acquired during the CHS programme, role-modelling and mentoring, and the adoption of new (formal) positions in their work. All participants reported that the CHS Master's programme led to a strong increase in their scientist identities. Prior to entering the programme, participants' identities as scientists were either weak or absent. The scientist identity developed steadily over the course of the programme and often continued to grow after the programme (Fig. 1). Half of the participants also reported increases in their clinician identities during the Master's programme, even though they spent less time performing actual patient care than they had done before they entered the programme. Participants attributed this increase to augmented reflection and scientific knowledge regarding their profession. Although all participants reported a high affinity for the provision of care, which more often increased than decreased during their clinician-scientist education, only half of the participants ( $n = 7$ ) felt inclined to stay active (either full- or part-time) as clinicians over the long term; others preferred full-time research ( $n = 2$ ), combined research and teaching ( $n = 3$ ), or full-time health policy and management work ( $n = 2$ ). The primary reason to continue working as a clinician was to maintain contact with their patients or the clinical profession:

I hope to be significant to these patients also over the long term via research. [I hope] that their chances of survival increase and that I can contribute to that personally... But I also need these patients to stay focused. (Rosa)

Concerns about losing their registration as nurses or physiotherapists and the uncertainty of (PhD or junior) research appointments were mentioned as practical motives for continuing in employment as clinicians. By contrast with their mixed ambitions regarding clinical work, all but one participant ( $n = 13$ ) aspired to conduct research on either full-time ( $n = 2$ ) or part-time ( $n = 11$ ) bases.

Formal working positions as clinicians, scientists or teachers were reported as strengthening participants' related identities. Importantly, the care provider identities of all the participants remained important, even for those ( $n = 4$ ) who were not currently working as such. One participant explained this from a private life perspective:

I continue to be a care provider in my private environment. My mother will more easily ask me to accompany her to the hospital than my sisters who are not involved in health care. I remain the nurse in the family. (Helen)

Role modelling and mentoring were mentioned as important factors in envisaging future positions. After the programme, participants were highly motivated to take on new roles and actively pursue and explore possibilities, including unpaid research activities. To obtain and maintain dual positions, however, participants must overcome logistical or practical hurdles. One participant, who had recently decided to focus full-time on her PhD, said:

Especially when you combine two jobs, that is pretty hard because you have to attend all of these meetings. They expect full commitment towards your doctoral research and clinical practice. Sometimes I found these hard to combine. (Julia)

In addition, participants are often required to negotiate for time and finances within their organisation or between different organisations:

I have noticed that it is hard to conduct research in a private practice setting. Here, you're expected to meet patient turnover rates. (David)

Both the individual contacts of participants, as well as the network gained through the programme, were important in obtaining new positions, especially because those outside academia, as well as many persons within academia, are not familiar with nurse- or physiotherapist-scientists:

Usually I will say [I am a]... “health-scientist” because nurse-scientist is not understood by many people, but I do add that it is the clinical side [of research]. (Gaby)

The lack of organisational support or facilitation of dual roles sometimes hampers the progression of the clinician-scientist career: part-time research appointments are scarce, forcing individuals to choose between full-time clinical and research careers:

It would be ideal if someone, like myself, could remain involved in clinical work for 2 days, and engage in research for 3 days [per week], but then the work floor should be more amenable to that possibility. (Kate)

#### *Reconciling dual identities: a meta-identity as broker*

Despite the logistical demands of securing dual job positions, participants perceived many advantages of working at the boundary and reported relatively little tension between their identities as clinicians and scientists. The minor tensions reported were reflected in a general sense of having to juggle different tasks ( $n = 2$ ), being aware of the increased distance from colleagues in care ( $n = 1$ ), taking care not to misuse caregiver–patient relationships for research goals ( $n = 1$ ), and a feeling of discomfort when the treatment of patients was not aligned with scientific insights ( $n = 2$ ):

When I have a patient and apply [treatment procedure], it makes me think extra hard because I have my doubts whether this [practice] is scientifically sound. (Magda)

The fact that tensions were absent or small seemed to be mediated by the image held by all participants of themselves as brokers, which they frequently described in their own words using the terms ‘bridge’ or ‘bridge builder’ between care and science:

A bit like the builder of bridges because you have knowledge of the profession, but also develop a broad scientific view. (Anna)

Another participant described the clinician-scientist as:

Someone with more knowledge of the nursing profession, the transcending, the scientific, the evidence-based practice, that allows you to reason critically and apply that in nursing practice... the

bridge between practice and research, that you are able to make that. (Mary)

Taking the meta-identity of the broker means that differences are to be expected, and this realisation implies being accepting of, and being able to deal with the competing perspectives, expectations and demands of the different roles.

#### **The effects of boundary crossing**

All participants perceived positive mutual influences between science and care. All four of the learning mechanisms (reflection, identification, coordination and transformation) described for boundary crossing<sup>25</sup> can be recognised in the narratives of the participants, and this theoretical lens helps us to unravel the experienced effect of science on care and vice versa. As reported earlier, the effect of science on care is mostly upfront: firstly, all participants indicated how becoming skilled as a scientist inevitably evoked *reflection* with regard to their clinical profession as they developed broader perspectives on patient care and the organisation of care. In addition, participants began to formulate reasoned views on developments in their field of care. Some participants reported a complex process of *identifying* with their care profession, which concerned their contrasting feelings of increased pride in the care profession together with awareness of changes in their relationships with former colleagues. All participants developed more critical and evidence-seeking attitudes and skills in this area, which for most led them to feel like a ‘clinician-plus’. Interestingly, two of the 14 respondents mentioned that this change led to feeling less confident in the care they provided because of their increased awareness of its limitations. Thirdly, examples connecting the two worlds were reported through *coordination*, such as in providing access to knowledge or literature to colleagues and clinical students:

What I notice clearly is that I’m very well informed about scientific evidence and sharing this information with my colleagues. [I ask them] did you read this? And [I] pass on knowledge in that way. (Magda)

Lastly, participants described *transformation* in which their scientific expertise led to new ideas and the initiation of care innovation.

Participants also reported that their clinical expertise influenced their role in research. Within a research team, participants observed that they

brought in *reflection* on patient perspectives and care implementation, focusing attention on the applicability of results and the translation of findings into practical recommendations. Clinical background was not reported as being important in *identification* as a researcher, but was reported to be important in the *coordination* of data from care to research, either directly by enabling the individual to collect data from his or her own patients or indirectly by ensuring collaboration within the field of care. This collaboration is achieved by demonstrating insight in daily work considerations and the ability to explain the relevance of good data to research. This increased commitment results in improved data access, and better explanations of the aims of a research project lead to improved data quality:

When you're able to explain to the nursing staff: "This is what we're going to do [with the data]," and we show them the result, they'll come to understand the benefits, unlike filling in some standard forms that end up in the wastebasket or some filing cabinet; then, people are not motivated to cooperate, and every additional request is just too much. (Tanja)

Most importantly, clinical expertise led to *transformation* in terms of putting clinical problems and knowledge gaps on the research agenda, addressing clinically relevant outcomes, and investigating the assumptions that arise from clinical observation:

Because you are working as [a] nurse... you know how things work in practice, which helps you as a scientist to bring to light certain existing gaps in knowledge. (Oscar)

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## DISCUSSION

### Professional identity perception and boundary crossing in clinician-scientists

We explored how novice non-physician clinician-scientists perceive their professional identities. During the early years of their clinician-scientist careers, nurse-scientists and physiotherapist-scientists unanimously experienced dual professional identities as clinicians and scientists. However, their position at the boundary enables them to connect these different fields, a role referred to in the literature as that of a 'broker'.<sup>32</sup> The crossing of borders creates new islands of meaning,<sup>24</sup> and being a broker between science and care is viewed as core to being a clinician-scientist. The status of broker serves as a meta-identity

from which potential logistical, ethical or content-related tensions are resolved between the two professional identities of clinician and scientist, and enables an active adaptation of behaviour according to context whilst preserving a personal sense of unity. Long and colleagues<sup>32</sup> investigated broker roles from the perspective of social network theories and concluded that brokers can transfer specialised knowledge from one context to another, synthesise different information sources, introduce ideas from one setting to another, and support cooperation between groups. Clinician-scientists have often been mentioned as playing vital roles in transforming clinical observations into research hypotheses and in translating clinical knowledge to the care of patients.<sup>4,5</sup> Our study adds insight into the mechanisms by which clinician-scientists make these unique contributions to the fields they connect.

### Implications for the education of clinician-scientists

Many different pathways to educate clinician-scientists exist. These pathways include non-specific routes, on which professionals individually pursue clinical and research training, or specific routes, for example (post) graduate/career track programmes that explicitly target clinician-scientists, such as the CHS programme attended by the participants in this study. The shortage of clinician-scientists has recently led to studies on the re-evaluation of training programmes for their education. The recommendations stress early recruitment, the integration of research and clinical training, and the importance of mentoring and early career support.<sup>8,14,15,33,34</sup> Nevertheless, little underlying educational theory on how to best prepare students for clinician-scientist careers is available.<sup>20,35</sup> Our study did not evaluate the success of an educational programme but sought to empirically contribute to the theoretical understanding of clinician-scientist identity formation. When clinician-scientists are educated through uncoupled pathways, clinical and scientific competencies are acquired separately, which can hamper the formation of a unique overarching clinician-scientist identity. Regarding professional identity formation, it is important that students are provided with authentic experiences and mentors who understand their roles.<sup>22</sup> These factors might explain why integrated programmes for clinician-scientists are successful in preparing students for such careers.<sup>8,15,16,33</sup> An increasing number of papers have argued that educational programmes are incomplete if they do not provide a basis for professional identity formation.<sup>21,22,36</sup> Our study showed that the identity formation of clinician-

scientists encompasses the emergence of a broker role. In addition, our study stresses the importance of developing boundary-crossing competencies: the ability to function competently in multiple contexts and connect these contexts does not result from scientific training *per se*, and should therefore receive explicit attention in clinician-scientist programmes. Limited literature is available on what constitutes a boundary-crossing competency in general, let alone those specifically for clinician-scientists, or how to stimulate their development.<sup>37,38</sup> Investigations of boundary-crossing competencies might help to strengthen the education of clinician-scientists.

### Implications for clinician-scientist careers

We found that novice clinician-scientists, at 1 year after their research training, report ample advantages of combining research and care tasks. Starting clinician-scientists actively seek part-time or combined positions in order to apply or maintain both competencies, but report logistical and practical hurdles. The organisational system is perceived as unfamiliar with, and unsupportive of, non-physician clinician-scientist positions, and, in consequence, active job crafting is necessary to obtain positions in which such individuals can exert both roles. Dual positions are often a personal combination of jobs instead of being offered from within one institution. Only half of the participants in this study expressed the ambition to remain actively involved in clinical work in the future. Given that our sample was purposely drawn from a broad range of the current work field, this result should not be interpreted as reflecting an exact percentage, but as a signal that a wide diversity of career ambitions exists and as a clue to how clinician-scientists want to make use of their dual expertise. Although a dual background undoubtedly influences subsequent practice in either research or care, the advantages of a connecting role will be significantly larger when the two practices are permanently combined within a career. Therefore, as has been previously addressed, recruitment and retention require attention with regard to clinician-scientists.<sup>4,7,12,14</sup> In light of our study, the tendency to focus on a career in only one field is not surprising because we know that broker roles are challenging. Brokers experience significant pressure because they cope with the demands of two jobs in one, as well as the complexity of translating between contexts. Therefore, brokers need to be supported in their roles if they are to function optimally.<sup>32</sup> To support the careers of clinician-scientists, organisations should offer positions with dual tasks to prevent individuals from being wrenched between organisations and responsibilities.

In addition, career tracks may not only alleviate logistical hurdles, but may also externally recognise the unique roles of clinician-scientists and the value they bring, thereby strengthening the process of professional identity formation.

### Dialogical self theory and boundary crossing as theoretical perspectives

Dialogical self theory<sup>23</sup> and boundary crossing<sup>25,32</sup> are helpful as theoretical perspectives for interpreting how clinician-scientists combine their dual roles. Moreover, these theories help to unravel how these distinct practices influence each other. Both theoretical frameworks have the potential for wider applications in the area of medical education. The medical world is highly specialised and fragmented, and the boundary crossing perspective is useful for the study of interaction and learning between different contexts, such as in interprofessional learning wards,<sup>39</sup> clinical placements,<sup>40</sup> management of clinical placements<sup>41</sup> and postgraduate education.<sup>42</sup> Dialogical self theory is useful for understanding the perception of one's unified self, whilst accounting for a diversity of identities. Therefore, it is well suited to the study of professional identity development across multiple roles such as those that occur in academic settings in which teaching, care, research and (often in later stages) management form parts of an individual's career.

### Limitations

Our study provides novel, yet initial, insights into clinician-scientist identity perception and how the participants' dual educational backgrounds are reflected in their daily practices. Further research is needed to fully unravel the intersection of the clinician-scientist role, how clinician-scientists may differ from clinicians or scientists, and how their (duality in) identity is formed and (re)shaped.

A limitation of our study is that we investigated a specific group of non-physician clinician-scientists (nurse- and physiotherapist-scientists) during the early phases in their careers after they had completed their educational programmes. Our results may have been influenced by the fact that the research programme implied a higher degree of academic training. Therefore, some of the influences ascribed to the boundary crossing between care and science (e.g. increased reflection) may be attributable in part to academic development in general. Comparative research with other groups (e.g. physician-scientists and long-established

clinician-researchers) is required to support generalised conclusions concerning clinician-scientists.

Furthermore, we studied trained clinician-scientists, regardless of whether or not they currently focus in their work on the typical combination of research and care. This provides insight into the motives and hurdles that arise in the clinician-scientist career and identity development. In a clinician-scientist career, these areas of work must be lastingly combined or alternated, but not necessarily in equal measure all of the time.

A third limitation is the single time-point of our study. Longitudinal studies are warranted to study the development of and influences on identity formation in clinician-scientists. Regardless of these limitations, however, it seems plausible that our core finding, the duality of professional identities with the broker role representing the clinician-scientist identity, is valid for all clinician-scientists regardless of clinical specialty or career stage. Boundary crossing is a mechanism that is likely to govern the potential valuable contributions that all clinician-scientists make to the future of care, although the details may differ.

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## CONCLUSIONS

Clinician-scientists consider themselves as both clinicians and scientists. They experience these professional identities as separate positions, dependent on setting and role. However, the two roles influence one another, and the unique professional identity of the clinician-scientist emerges in the meta-identity of the broker who connects science and care. To facilitate the connection of these two contexts, the development of boundary-crossing competencies within clinician-scientist programmes merits explicit attention. Furthermore, the broker position should garner reflection to stimulate the professional identity formation of clinician-scientists.

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## REFERENCES

- Bornmann L, Mutz R. Growth rates of modern science: a bibliometric analysis based on the number of publications and cited references. *J Assoc Inform Sci Tech* 2015;**66** (11):2215–22.
- Butler D. Translational research: crossing the valley of death. *Nature* 2008;**453** (7197):840–2.
- Roberts SF, Fischhoff MA, Sakowski SA, Feldman EL. Perspective: transforming science into medicine: how clinician-scientists can build bridges across research's 'valley of death'. *Acad Med* 2012;**87** (3):266–70.
- Lemoine NR. The clinician-scientist: a rare breed under threat in a hostile environment. *Dis Model Mech* 2008;**1** (1):12–14.
- Schafer AI. The vanishing physician-scientist? *Transl Res* 2010;**155** (1):1–2.
- National Institute of Health. Physician-Scientist Workforce (PSW) Working Group Report. 2014. [http://acd.od.nih.gov/reports/PSW\\_Report\\_ACD\\_06042014.pdf](http://acd.od.nih.gov/reports/PSW_Report_ACD_06042014.pdf). [Accessed 27 May 2015.]
- Morel PA, Ross G. The physician scientist: balancing clinical and research duties. *Nat Immunol* 2014;**15** (12):1092–4.
- Deluca GC, Ovseiko PV, Buchan AM. Personalised medical education: reappraising clinician-scientist training. *Sci Transl Med* 2016;**8** (321):321 fs2.
- Yanos PT, Ziedonis DM. The patient-oriented clinician-researcher: advantages and challenges of being a double agent. *Psychiatr Serv* 2006;**57** (2):249–53.
- Gordon R. The vanishing physician scientist: a critical review and analysis. *Account Res* 2012;**19** (2):89–113.
- Nathan DG. Careers in translational clinical research – historical perspectives, future challenges. *JAMA* 2002;**287** (18):2424–7.
- MacDonald SE, Sharpe HM, Shikako-Thomas K, Larsen B, MacKay L. Perspective: entering uncharted waters: navigating the transition from trainee to career for the nonphysician clinician-scientist. *Acad Med* 2013;**88** (1):61–6.
- Mackay M. Why nursing has not embraced the clinician-scientist role. *Nurs Philos* 2009;**10** (4):287–96.
- Daye D, Patel CB, Ahn J, Nguyen FT. Challenges and opportunities for reinvigorating the physician-scientist pipeline. *J Clin Invest* 2015;**125** (3):883–7.
- Eley DS, Wilkinson D. Building a teaching-research nexus in a research intensive university: rejuvenating the recruitment and training of the clinician scientist. *Med Teach* 2015;**37** (2):174–80.

- 16 Wong MD, Guerrero L, Sallam T, Frank JS, Fogelman AM, Demer LL. Outcomes of a novel training programme for physician-scientists: integrating graduate degree training with specialty fellowship. *J Grad Med Educ* 2016;**8** (1):85–90.
- 17 Rosenblum ND, Kluijtmans M, ten Cate O. Professional identity formation and the clinician-scientist: a paradigm for a clinical career combining two distinct disciplines. *Acad Med* 2016;**91**:1612–7.
- 18 Coller BS. Translational research: forging a new cultural identity. *Mt Sinai J Med* 2008;**75** (5):478–87.
- 19 Ibarra H. Provisional selves: experimenting with image and identity in professional adaptation. *Admin Sci Q* 1999;**1999** (44):764–91.
- 20 Parker K, Burrows G, Nash H, Rosenblum ND. Going beyond Kirkpatrick in evaluating a clinician scientist programme: it's not 'if it works' but 'how it works'. *Acad Med* 2011;**86** (11):1389–96.
- 21 Monrouxe LV. Identity, identification and medical education: why should we care? *Med Educ* 2010;**44** (1):40–9.
- 22 Trede F, Macklin R, Bridges D. Professional identity development: a review of the higher education literature. *Stud High Educ* 2012;**37** (3):365–84.
- 23 Hermans HJM, Gieser T, eds. *Handbook of Dialogical Self Theory*. Cambridge: Cambridge University Press 2012.
- 24 Lindgren M, Wählin N. Identity construction among boundary-crossing individuals. *Scand J Manag* 2001;**17** (3):357–77.
- 25 Akkerman SF, Bakker A. Boundary crossing and boundary objects. *Rev Educ Res* 2011;**81** (2):132–69.
- 26 Akkerman S, Bruining T, van den Eijnden M. Multi-level boundary crossing in a professional development school partnership. *J Learn Sci* 2016;**25** (2):240–84.
- 27 Creswell JW, ed. *Qualitative Inquiry and Research Design: Choosing among Five Approaches*, 3rd edn. Thousand Oaks, CA: Sage Publications 2013.
- 28 DiCicco-Bloom B, Crabtree BF. The qualitative research interview. *Med Educ* 2006;**40** (4):314–21.
- 29 Sandelowski M, Barroso J. Classifying the findings in qualitative studies. *Qual Health Res* 2003;**13** (7):905–23.
- 30 Guenette F, Marshall A. Time line drawings: enhancing participant voice in narrative interviews on sensitive topics. *Int J Qual Methods* 2009;**8** (1):85–93.
- 31 Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;**3** (2):77–101.
- 32 Long JC, Cunningham FC, Braithwaite J. Bridges, brokers and boundary spanners in collaborative networks: a systematic review. *BMC Health Serv Res* 2013;**13** (158):1–13.
- 33 Kosik RO, Tran DT, Fan AP *et al*. Physician scientist training in the United States: a survey of the current literature. *Eval Health Prof* 2016;**39** (1):3–20.
- 34 Brass LF, Akabas MH, Burnley LD, Engman DM, Wiley CA, Andersen OS. Are MD-PhD programmes meeting their goals? An analysis of career choices made by graduates of 24 MD-PhD programmes. *Acad Med* 2010;**85** (4):692–701.
- 35 Marsh JD, Todd RF III. Training and sustaining physician scientists: what is success? *Am J Med* 2015;**128** (4):431–6.
- 36 Cruess RL, Cruess SR, Steinert Y. Amending Miller's pyramid to include professional identity formation. *Acad Med* 2016;**91** (2):180–5.
- 37 Walker D, Nocon H. Boundary-crossing competence: theoretical considerations and educational design. *Mind Cult Act* 2007;**14** (3):178–95.
- 38 Fortuin I, Bush SR. Educating students to cross boundaries between disciplines and cultures and between theory and practice. *Int J Sustain High Educ* 2010;**11** (1):19–35.
- 39 Falk AL, Hult H, Hammar M, Hopwood N, Dahlgren M. One site fits all? A student ward as a learning practice for interprofessional development. *J Interprof Care* 2013;**27** (6):476–81.
- 40 Daly M, Roberts C, Kumar K, Perkins D. Longitudinal integrated rural placements: a social learning systems perspective. *Med Educ* 2013;**47** (4):352–61.
- 41 O'Keefe M, Wade V, McAllister S, Stupans I, Burgess T. Improving management of student clinical placements: insights from activity theory. *BMC Med Educ* 2016;**16** (1):219.
- 42 Arulanandam S, Macpherson R. Training Across Boundaries. *Clin Teach* 2015;**12** (2):78–82.

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