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Signing Communities Dealing with Non-Knowledge: Some Cases from Nursing

Abstract: This article takes signatures and practices of signing as a point of departure for exploring and understanding nurses' work with non-knowledge as a new responsibility. In this context, non-knowledge does not relate to the absence of knowledge as such but to the practices by which nurses recognize knowledge challenges and implement strategies for specifying, explicating and further detailing what they know they do not know. Here, nurses' work with procedures is used as a specific example of non-knowledge. Considering signatures as a community-forming device takes us directly into these new work situations. It provides fertile starting points for the analysis of engagement with non-knowledge, traces different ways in which the signature is achieved and points to significant changes in professional work.

Keywords: professional work, non-knowledge, signature, community-formation devices, nurses' extended roles and responsibilities

Within the field of nursing, the practice of signing has been the centre of much debate and is closely linked to discussions about accountability and risk management on the front line of patient care. Thus, there is an extensive literature on practices related to the signing of checklists by nurses, "double signing" for medication and how the practice of co-signing with other professions may enhance patient safety. In recent years, researchers have put a spotlight on a new type of signature culture emerging in nursing, that is, their engagement in signing procedures and work descriptions. The backdrop of this development is related to the spread of evidence-based nursing. Implicit in evidence-based notions is that knowledge must undergo specific approval and quality assurance processes or "signing" before it is committed to practice. To address this, a new body of literature has emerged describing how groups, representing different knowledges and stakeholder interests operating with explicitly described methods, review evidence and sign procedures and how their work contributes to the issues at stake (Knaapen, 2013; Levay & Waks, 2009; Moreira, 2005; Nerland & Jensen, 2012; Nes & Moen, 2010; Polit & Beck, 2008). However, the argument put forward in this article is that we need to move beyond existing frameworks to understand the evolving role of these groups.

The existing literature has two main strands. The first takes the perspective of knowledge, and the second re-conceptualizes professional expertise in terms of non-knowledge, thereby better describing the work being studied. Moreira's (2005) path-breaking study of practitioners' work within the framework of the National Institute for Clinical Excellence (NICE) in the UK may serve to illustrate the first strand in the literature. She draws on a theory of evaluative regimes and shows how

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members of a group working for NICE discuss procedures according to their robustness (science), acceptability (politics), usability (practice) and methodological adequacy (process). She also demonstrates how practitioners can uniquely contribute to the knowledge generated by these agencies owing to their multiple memberships of different communities.

The second strand consists of fewer studies and addresses what researchers describe as the spread of non-knowledge. One interesting example of this approach is that published by Loes Knaapen (2013). Drawing on material gathered from two guideline development organizations that promote and follow EBM (evidence-based medicine) principles (the Dutch Institute for Health Care Improvement in the Netherlands and the PEBC in Ontario, Canada), Knaapen analyses how guideline developers address the challenges of providing evidence-based advice in situations where the evidence is lacking, of poor quality, immature or incomplete. Thus, in addition to opening up an investigation on the difficult subject of knowledge voids and uncertainty in this context, her study underlines how the spread of non-knowledge in society creates new responsibilities for members of guideline groups. Viewed in a broader context, she shows that more classical "knowledge-only" approaches to the study of guideline groups may be too narrow and lack scope and truth because they focus only on the knowledge we have and ignore the knowledge we lack. To further explore these responsibilities, she suggests that a shift of the theoretical lens to non-knowledge may be helpful and points to a range of typologies and frameworks that have been developed by researchers working within the sociology of ignorance and the social studies of science.

In our own studies, where novice practitioners were followed at three different points in time over a period of eight years (2003-2010), the emergence of a variety of forums and groups where nurses were called on to sign and work with procedures was identified. Consistent with the work of Knaapen, it was found that, rather than focusing on existing knowledge, the nurses working in these groups were engaged with exploring the unknown. A unique feature was that they used their knowledge of the unknown to build the capacity of institutions to respond to non-knowledge on a more continuous basis. In addition, rather than only involving élite segments of the professions working for national and multi-national agencies (Knaapen, 2013; Moreira, 2005), the findings demonstrate that participation has become more common and widespread, which suggests changes in the core of nursing practice itself. In the later studies, in particular, it became apparent that a significant number of nurses had experience of such work via participation in groups where their task was to sign procedures. Thus to further our discussion on the rise of a signature culture it is argued here that we need more knowledge about what takes place in these groupsmonely when the profession and its inherent practices are undergoing changes. In this article, the central argument is that the shift of attention to non-knowledge, together with a focus on the signature (who signs what and for what purposes), provides a starting point for establishing a framework to address this.

The article is structured as follows. The next section briefly describes the general spread of non-knowledge in society and introduces concepts that have typically been applied to analyses of the different forms it takes. Subsequently, it draws on data from the above-mentioned projects to illustrate how the quest for the signature mobilizes nurses to engage in core challenges described in the literature. In a wider context, the article suggests that focusing on the signature and the communities they form is a fruitful way of understanding why and how nurses coalesce around different causes as well as a way of gaining a deep empirical and analytical insight into the emergence of new roles and responsibilities. In relation to the general theme of this special journal issue, the article is in line with the other contributions which employ a socio-material perspective on the signature. However, rather than looking at how it works in and for itself, that is, "black boxing certain knowl-

edges," routing decision-making etcetera, it focuses on how the quest for the signature stimulates community formation.

The growth of the unknown

In the last few decades, numerous scholars have drawn attention to how the rapid acceleration of knowledge accumulation in the "knowledge society" has created more areas of ambiguity and made ignorance and the unknown increasingly frequent (Adam, 2004; Gross, 2012; Kastenhofer, 2010). Indeed, by many accounts, dealing with the unknown and uncertainty in today's society may pose a more fundamental problem than the inability to accurately analyze known interactions. Scholars have offered different explanations for the spread of non-knowledge, often describing it as an ironic consequence of the prevalent interest in the science which is characteristic of the so-called "knowledge society." A range of possibilities are described, but this article concentrates on three aspects only.[1]

First, increasing amounts of non-knowledge can be understood as an outcome of the growing difficulties in securing the uptake of knowledge. As knowledge is developed rapidly across a range of sites, it can be observed that the growth of "objective culture" sometimes outstrips the pace of growth of "subjective culture" (Gross, 2012). Another aspect relates to the more general challenge of predicting the future. Science projects trends and predicts and makes forecasts. Its knowledge of the future is based on evidence derived from a known past. However, much of human futurity is not of the kind that can be extrapolated from a known past. One aspect is that, as humans, people have choices and can thus decide to take a course other than the one predicted (Adam, 2004). Another is that however hard people try to predict and control the future, they have to cope with the unexpected in terms of surprise insights (Gross, 2012) and "blind spots" (Kastenhofer, 2010) in knowledge. A third issue concerns the paradoxical effects of risk-focused technologies, themselves a consequence of rapid scientific development. By bringing the future into the present, as science does, uncertainty is tempered and transformed into a risk factor to be calculated and managed. This has paved the way for new actor constellations that shape not only the way scientific knowledge is translated into action but also which kind of knowledge is produced and which experts are listened to. (Kastenhofer, 2010). This may give priority to certain knowledge orders at the expense of others and may result in potential imbalances between knowledge types.

In short, these depictions highlight the fragile and provisional nature of knowledge, notwithstanding the care and competence with which it is produced. It is against this background that reference is made to our society as a non-knowledge (Beck, 1999) rather than a knowledge society. Whether or not one accepts this diagnosis, there seems to be a general agreement among researchers that it is precisely in the age of knowledge-intensive technologies that people need to become accustomed to an irreducible, persistent non-knowledge. Living with non-knowledge is now a fact of life, so the interesting question becomes: what systems does society need to put in place so that institutions can cope with and build resilience to it? While there are still a number of relatively unexplored features of the knowledge society, there is a growing awareness that non-knowledge cannot be adequately managed through existing knowledge-handling methods and traditional "top-down" risk regimes alone but may also require the development of more bottom-up approaches. Hence, a focus on non-knowledge re-shuffles entrenched lines of authority and the established ways of conceptualizing expertise. What is crucial

[1] For a more detailed overview, see the essays in *Agnotology: The making and unmaking of knowledge and non-knowledge* (Proctor & Schiebinger, 2008).

here is how systematic non-knowledge can be managed and at the same time transferred to decision-making constellations. Thus the professions which are caught up in this process face the task of revising their epistemological premises.

Ways of not knowing and the relevance of community formation

How can modern, professional cultures better deal with the presence of unknowns in current and upcoming predicaments? As pointed out by Knaapen (2013) and others working in the non-knowledge tradition (see above), the first step towards an effective response is to recognize the existence of the unknown and understand its complex social character. There exists a range of possible variations in knowing about not knowing. One who has done much to assist in classifying the different variants of non-knowledge is Böschen (2013, Böschen et al., 2010). Non-knowledge is present when there is insufficient knowledge about a certain issue or problem to be solved and when the actors involved are aware of what it is they do not know. Further, core assumptions are that non-knowledge is constructed, assessed and communicated in contrasting or even incompatible ways that can be variously conceptualized as a variant of knowledge (a known unknown, a calculable risk, a not-yet-known) or the entirely unknowable (unknown unknowns). Thus, here, non-knowledge refers to a clearly defined realm of the unknown (Böschen et al., 2010). An effective approach is also dependent on recognizing that the unknown is not a hollow void, uninteresting and uninviting. On the contrary, the unknown carries a generative potential. Hence, the multiple types of non-knowledge can be identified and worked on discretely by different agents or groups. To capture the generative possibilities inherent in this perspective and the way this work is distributed, such an approach needs to be further contextualized. Representations of non-knowledge arise out of particular contexts and are shaped in complex interactions among social actors. As expert communities increasingly specialized and positioned with responsibilities for non-knowledge and problem-solving, the strategies of the professions are likely to vary in different settings, roles and tasks.

Böschen (2013) elaborates on this issue and suggests that a useful starting point for an analysis that differentiates between contexts and roles and responsibilities may be to delineate between epistemic communities and communities of practice. Epistemic communities are typically oriented towards the production of knowledge which focuses on a specific field of objects. By way of contrast, practice communities are oriented towards the elaboration of specific actions and the construction of explicit knowledge is a means, not an end. Thus, he advocates that a community of practice approach may be useful when further developed to encompass the new roles and responsibilities of actors and agents beyond research communities. However, as nurses' work with non-knowledge is a relatively unexplored area, and bearing in mind the potential multiplicity of knowledge challenges the growth of the unknown represents and the variety of places where communities are made and articulated, it is suggested that a "richer way" forward is to focus on the signature as a community-forming device. Such an approach, which uses other community-forming devices (e.g. discussions lists, conferences, journals and other devices that mobilize joint enterprise), has proved useful in other knowledge settings to discuss emergent trends (see Akrich 2010; Meyer 2010; Molyneux-Hodgson & Meyer, 2009). Another issue is that traditional notions of community have been revised and expanded in recent years. Thus there exists a greater variety of community approaches that can be used as a sensitizing means in an analysis of the roles and responsibilities for non-knowledge than the two discussed by Böschen.

First, the term epistemic community has been expanded to include groups formed for other purposes than to conduct research. A significant contribution in

this regard is the work by Haas (1989, 1992). He takes as a point of departure that technical uncertainties and the complexities of knowledge have made international policy coordination both necessary and increasingly difficult, and that expert communities—in his terms, epistemic communities—increasingly take significant roles in these efforts. Haas defines an epistemic community as "a network of professionals with recognized expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge" (Haas, 1992, p. 39). In the context of the increased complexity of knowledge, he discusses how the involvement of epistemic communities in decision-making may include different forms of testing to elucidate cause-effect scenarios. Based on this, advice can be provided about the likelihood of a certain course of action and policies can be formulated for specific issues or areas of social life. Further, he demonstrates that although epistemic communities are often temporally and spatially bounded, in that their existence is defined by a specific problem and its possible solutions, their engagements may have a longer life (Adler & Haas, 1992). Once their ideas or interpretations are accepted, their influence will continue through processes of institutionalization.

Second, more recent theorizing treats communities intrinsically as "communities of hope" or "communities of promise" (Brown, 2003, 2006). This line of thinking views communities as centred on the future, their current activities being moulded by and constructed upon a vision of the imagined future. According to Brown (2006), communities of promise are highly complex and multi-authored, allowing those involved to co-operate in prescribing future developments (p. 10). Importantly, within communities of promise, expectations are performative; they attract the interest of allies, define roles, build obligations, produce agendas, guide activities, provide structure and legitimacy and foster investment (Borup, Brown, Konrad, & Lente, 2006). In this sense, epistemic communities revolve around a manifest absence of potentially useful knowledge and thus constitute "communities of opportunity".

Finally, Adam (2004) describes the interactions between the "virtual real" and "actual real" as a key to understanding commitments for what she describes as the long-term future. In this context, "virtual" refers to the ways in which certain ideals are rendered important, thus requiring attention. It provides a potential first step towards erecting a structure of responsibility in the form of a community of concern and a commitment obligation to long-term futures. A common denominator of all of these types of communities is that they are productive units.

In this article, it is argued that invoking different notions of community to shed light on the multiple responsibilities professionals have in relation to the unknown may help to identify what nurses "do" in different contexts. This may also assist our understanding by directing attention from simply what experts know or do not know to how they deal with the challenges described in the literature. Before providing concrete examples to advance the discussion of non-knowledge and the different types of communities that the signature mobilizes, a short description of the study from which the examples are drawn is provided.

Our study

The examples that follow were drawn from the above-mentioned Norwegian studies, ProLearn (2004-2008) and LIKE (2008-2011). These investigated knowledge relations and conditions for learning in the following professions: nursing, teaching, auditing and computer engineering. Hence, the purpose of these studies was not signing and signatures as such. The projects consisted of a range of activities designed to build upon each other and, with respect to the nurses, there was an opportunity to identify sites where the signing of procedures was a core activity. A total of 40 practitioners, ten from each of the professional groups, were followed from

graduation and at three points in time during their first six years of working life. The methods used were questionnaires,[2] individual and group interviews and learning logs. In addition, we conducted case studies of specific artefact-mediated practices in working life as well as a study of knowledge strategies in the main professional associations (Nerland & Karseth, 2013). As to the nursing profession, these activities included a study of the work of clinical nurse developers in two large hospitals which, among other things, are responsible for organising local work on clinical procedures (Christiansen, Carlsten, & Jensen, 2009), and a case study of how work descriptions and procedures are consolidated in a bigger Norwegian hospital (Nes & Moen, 2010).

Taken together, the studies show that the nursing profession is infused with strategies for framing and dealing with non-knowledge. There exists a variety of forums, instruments and routines to collectively explore the complexity, diversity, uncertainty, ambiguity, indeterminacy and limits of knowledge. Moreover, the active participation of practising nurses and their capacity to understand and respond to what is unknown have become an increasingly important part of new policies at both the local and national levels. An especially interesting aspect of these studies is how signing and signatures constitute a site through and at which these new accountabilities and responsibilities are enacted (Jensen, Lahn, & Nerland, 2012).

This article represents an extension of these studies in which the scenarios are examined from the perspective of the signature as a community-forming device. For this purpose, data from the individual interviews, logs and focus-group interviews and the two case studies with nurses working in the same hospital wards was re-analysed, with a particular focus on events that mobilized communities to sign. Detailing how signing communities came into being in these cases and how they operated facilitated the exploration of the multi-faceted nature of nurses' work with non-knowledge and how this helps to deal with challenges described in the above-referenced literature. For example, what practical arrangement is put in place, and what social needs are dealt with by the act of signing? From whom is the signature demanded, and what strategies are deployed to secure it? In order to pursue how nurses efforts in these groups may help to deal with challenges described in the literature on non-knowledge the different notions of community described in the previous section are invoked.

Examples of signing practices and community formation in nurses' work

In the first scenario, connections are made to key ideas in Haas' conceptualization of epistemic communities to discuss how nurses deal with challenges related to the uptake of knowledge produced elsewhere. In the second scenario, there were attempts to deal with blind spots and surprise insights through the development of a model to produce and sign procedures from below. Here communities are viewed intrinsically as communities of promise and hope. The third utilises the concepts developed by Adam in order to illustrate the formation of a community of concern in the context of an imbalance in knowledge.

[2] The participants approached for qualitative studies were selected from a larger survey study, StudData, carried out by the Centre for the Studies of Professions at Oslo and Akershus University College of Applied Sciences.

The call for a national clean-up and the mobilization of an epistemic community

In 2009, a survey aimed at obtaining an overview of procedure development and management in Norwegian hospitals was conducted. The results were described as "startling" and revealed that many procedures were outdated or of poor quality. Others simply could not be followed. Some hospitals also had completely different procedures in different departments for the same treatment. The findings also revealed that the culture of knowledge sharing in and among hospitals was not well developed (Dagens Medisin, 2009, November 26). It was concluded that procedure development and management in hospitals was in a terrible state and that collective efforts were needed to secure good practice. To contribute to this process, the nurses in the hospital under study purchased a repository, which was commercially produced by the Norwegian Nurses' Organization, in conjunction with the publishing company Akribe. This repository was created as a means of circulating best practice within and among hospitals in Norway. The 300 or so procedures it contained had already been validated, written and signed by a team of national experts and were believed to adhere to the statutory framework, national standards, professional guidelines and research-based knowledge. Thus, they might serve as a baseline to compare and contrast those in the departments and wards in the given hospital. The repository also afforded people the space to sign (tick) off procedures that were accepted as well as a space to offer explanations to the management of the national repository if they were rejected. Responsibility for the local work was delegated to the clinical nurse developers (CNDs) who were asked to identify the best procedure and sign accordingly. Although the clean-up was to take place relatively quickly to avoid further reputational damage, the sequencing of this process allowed the clinical nurse developers to account for their interpretations and make their reflections known to others. This created spaces for discussion and exchange of experiences where staff representing different units in the hospital could bring forward local variations, routines and personal experiences to support their views. Nurses' sharing of these experiences form the setting upon which further exchanges are built. Hence, the call for the signature here allows for a community that bears some resemblance to what Haas describes as an "epistemic community to come together"; that is, nurses' expertise is acknowledged as policy relevant.

By comparing and contrasting procedures in order to determine which to choose, the nurses were concerned about their potential for adaptation. They knew from their many visits to the wards how important it was for nurses to have updated procedures that were "well explained." Thus, from the perspective of non-knowledge, one could say that a "known unknown" was being examined. To explore this unknown, the nurses engaged in strategies characteristic of epistemic communities (see Haas above), for example, cause-effect scenarios, as a means of exploring their potential consequences. Both existing and prospective conditions were reviewed in their discussions and, in particular, they considered whether organizational changes were needed to make the procedure work. The final step in this sequence involved choosing which procedures suited their respective wards. Thus, in this setting, signing provided a means for exerting control and ensuring good practice as opposed to the multiplicity of somewhat arbitrary procedures that had sparked the need for the clean-up. Moreover, in several ways, the nurses' practices served as a means to proactively address challenges relating to the uptake of knowledge on a more general basis. First, through cause and effect analysis, established routines and conventions were opened up for investigation and renegotiated, for example, how the training was organized, the internal division of labour, resource allocation etcetera. Another aspect is how the nurses, through their work with Akribe, could add information which the national team of experts could use to make improvements. Hence, the work done in this setting may have a longer life

by contributing to the further development of Akribe as a tool and by providing an opportunity to address the challenges identified in the local infrastructure.

Dealing with knowledge gaps and the formation of a community of promise

The second scenario describes the "Ullevål Model," after the name of the hospital in which it was developed. It was introduced in 2009 and represents an emergent and more bottom-up way of working, that is, procedures are developed from below in the local hospital setting. Here, rather than restricting nurses' engagement with knowledge to that which is brought into play by others, the model encourages the nurses to suggest, explore and sign new procedures for inclusion. The model was initiated in 2002 by a group of nurses who had recently completed their continuing education in intensive care, theatre and paediatric nursing in Australian universities and hospitals. While in Australia, they became used to asking questions about clinical practice and working according to the principles of evidence-based practice. The further development of such tools could be useful for dealing with knowledge gaps and blind spots in the existing infrastructure which they and their colleagues encountered in their daily work in Norway. Examples of such knowledge gaps identified as in need of further development included whether existing procedures for pain relief were also valid for newborn babies; the discovery of inadequate guidelines for the intravenous administration of a particular medication in a hospital and the recognition that nurses performed the same tasks in different ways. Upon their return, the nurses made proposals and, in effect, designed a system that acknowledges uncertainty and anticipates the emergence of not-yet-knowns on a continuous basis.

The model designed by the nurses involves linking with national repositories as well as searching libraries and databases to further explore the blind spots, queries and knowledge gaps identified. If the evidence gathered in each case is sufficient, the procedures are signed and submitted for further distribution through the national health library. The forms and templates used in the model provide an agreed definition of the weight of the evidence. The fact that all searches are comprehensively described and included in the appendix to the finished procedure, along with the convention of dating procedures, allows others to see the limitations inherent in the knowledge produced.[3] The process is continuous as the model is driven by what Brown (2003, p. 5) calls a "knowledge economy of expectations." Typically, it starts in the wards through the observation of a "blind spot," or it could be a simple query concerning the way things are done. The problem or knowledge challenge is passed on through confidence pathways which also serve as sites for relevance testing. Through the step-by-step methodology in the model, problems are opened up for exploration and are related to wider knowledge developments within the field.

The local model turned out to be a success and was expanded first to include nurses from other departments and subsequently to include other healthcare personnel before becoming a template for a national model for procedure development. With each expanding step, the potential purposes this could serve and how it should work were set out in new proposals. These aspirations fed into the design of the model and provided it with an ever-widening range of aspirations, expectations and imaginings. In the current memorandum for the national model, in order to qualify as a member, institutions and units have to commit to submitting two new procedures annually for distribution through the networks. This serves as proof of

[3] See Stromme, Bjoro, Bredal, & Borgen (2009) for more information about the "Ullevål Model."

their innovative potential and as evidence that their field represents a viable user community. Follow-up research has spoken of a "procedure mania" in Norway as institutions mobilize to meet the temporal and other requirements of the new memorandum. Hence, nurses working in hospitals all over Norway are pulled into commitments to update and sign procedures. This highlights the dynamism that emerges from the model's means of encouraging continuous development from below: "within communities of promise, expectations structure and organize a whole network of mutually binding obligations between innovators, investors, consumers, regulators and so on" (Brown, 2003, p. 6).

Since its launch, the national model has been praised for its production of useful knowledge. Nevertheless, there is also a growing feeling that the model might create imbalances in the types of knowledge that might become available owing to the emergence of quantitatively different opportunities to sign at a sufficient pace. In particular, concerns have been raised that it may be biased against sectors and knowledge areas that have historically been under-resourced and unable to fulfil the requirements for participating in the model. Hence, as nurses' work has developed into a national strategy, it has taken on many of the characteristics described in the literature with respect to communities of promise; it enforces its promise to the point where the promise may become a threat (Brown, 2003). As noted in the following scenario, the nurses also have other means of securing the signature.

The "not yet knowable" future and the establishment of a community of concern

The third and last scenario invokes ideas from Adam (2004) about the formation of a community of concern to discuss how nurses in "newborn Norway" deal with dissatisfaction with existing procedures. Here, a nurse described how the group she worked with struggled for years to find alternative ways of taking blood samples from newborn babies without causing unnecessary pain. This type of care, as she explained, generates a range of unresolved questions and knowledge gaps because the research is lagging. The existing practice in the hospital in which she worked was to take blood from babies' heels although the problems this entailed were well recognized. From a clinical perspective, medication had to be given priority, and therefore, the veins in the babies' wrists could not be used. However, from the viewpoint of pain management, the nurses were concerned about the long-term psychological consequences for newborns. Thus, there was an epistemic clash. The nurses recognized the relevance of both perspectives, and while they did not play one epistemic approach off against another, they saw it as their challenge "to find a way out". With this objective, they raised the issue several times with the doctors working in their units and with other specialist groups, but no one seemed to have a better solution.

However, the nurses could not and did not leave it at that. To solve their problem and muster support, they participated in conferences arranged by their respective specialist groups and arranged field trips to other hospitals in Norway and other places in Scandinavia. Consequently, they did not only "learn a lot," but through conversations with others, they made clear the "zones of incompatibility between knowledges" they had discovered and what was at stake. Through this, they managed to engage ever wider circles of personnel interested in "newborn Norway" in discussions and formed a community of concern. It became clear that despite their irreconcilable stances in relation to this issue, healthcare personnel share some taken-for-granted assumptions with respect to what it means to be a professional. One such assumption is the imperative of responsibility embedded in notions of care. Such notions revert back to the idea of a religious calling, but they have been revitalized and renewed through newer conceptualizations that underpin the profession, that is, the philosophy of care embedded in nursing theories which

have a strong foothold in Norway. Thus, concerns are seen as demanding an active response by taking responsibility for what is cared about, and as a consequence, the circle of concern expands further: "being at these conferences was like throwing a stone in water—where you can see the rings of interest spread." In a further iteration of the story, the nurse tells how these contacts then formed the basis for joint procedure development related to a technique introduced by colleagues working in a hospital in another part of Norway. In practice, the solution to the newborn problem was to use the veins in the head. By doing so, the babies were relieved of so much pain that they could sleep during the entire procedure.

This scenario illustrates how the nurses, through their awareness of not knowing and persistence to explore the unknown, were able to keep an issue alive that otherwise might have gone unnoticed. Furthermore, it creates a climate for the future orientation of nurses as well as an alertness to maintaining ongoing interactions with others to deal with the not yet known. Not only is a new technique found here, but knowledge is enriched in several ways by the nurses' collaborative efforts and community formation. The solid argumentation provided through the collaboration of "newborn Norway" enabled the nurses to mobilize a signature that offered an alternative circuit of knowledge to existing practice. From a wider perspective, this example provides an opportunity to reflect on the complementary roles of institutions and the specialist professional groups that work in them. This may be particularly important when one considers contemporary transformations in the practice of signing in the light of the further development of the Ullevål model and the dominance of multinational institutions.

Summary and suggestions for further advancement

This article has taken signatures and practices of signing as a point of departure for exploring and understanding nurses' work with non-knowledge as a new responsibility. In this context, non-knowledge does not relate to the absence of knowledge but to the practices by which nurses recognize knowledge challenges and implement strategies for specifying, explicating and further detailing what they do not know. Here, nurses' work with procedures has been used as a specific example of non-knowledge. Considering signatures as a community-forming device has taken us directly into these new work situations. By focusing on the three signature communities discussed above, we observed how nurses' engagements and strategies led to the development of the institutional robustness called for in the literature. In particular, the examples and data extracts illustrated three distinct issues relating to non-knowledge. First, as knowledge is developed rapidly and from multiple sources, hospitals faced the problem of keeping up with developments and absorbing them. Another challenge related to the identification of risks and "blind spots" in knowledge from below and putting in place systems that can deal with knowledge on a continuous basis. Finally, there was a need to maintain a balance in the knowledge produced. Thus the communities they form may sometimes be defined by a specific problem and its possible solutions. Other communities may emerge from more persistent knowledge challenges and have a longer-term character.

In the national clean-up scenario, more general challenges emerged in relation to securing knowledge produced from elsewhere. Nurses' experiences of such issues, especially sharing them, form the setting upon which further exchanges are built. Hence, the call for the signature here allowed an epistemic community based on policy-relevant experience to come together. Second, the case of the Ullevål project showed how the nurses first participated in developing an efficient model for the production of procedures for use within and beyond the hospital they work in and how they use this model to ensure the continuous unfolding of the problems

under investigation. In outlining some of the ways in which this model works and has spread, attention was drawn to the role of expectations and imaginations that are constitutive of communities of promise. The third scenario confronted the difficult situation of knowledge which is stabilized but in a way that causes concern. Here, certain practices of collective remembrance were identified through which a group brings something to mind that might otherwise have gone unnoticed and not kept alive as a challenge. In these circumstances, the nurses could not accept the unknown. Owing to an epistemic clash, it was apparent that good work could not be achieved in the normal conditions of daily life. Thus, it could be said that nurses keep the unknown in a state of abstract deficiency. This, however, can be rendered very concrete as well as socially significant to the rest of "newborn Norway." The discrepancy between what is and what is not yet realized forms the basis of a community of concern. In this case, the nurses find a "way out" and are able to devise a new procedure. The ways in which they operated in the different phases of this process reveal something fundamental about how nurses work collaboratively within shifting constellations, that is, how they are able to mobilize themselves efficiently while at the same time maintaining a stable structure for long-term commitments.

It is suggested that shifting the focus of these debates to non-knowledge can offer a fresh perspective on nurses' roles and responsibilities. In particular, it is a unique entry point into thinking about issues that have long been conceptualized in terms of a knowledge-only approach. Taken together, the scenarios illustrate how participation becomes more than a question of what experts know or do not know. Instead, it is a matter of recognizing what may be the far-reaching consequences for the future of building capacities for resilience in local environments. This could both reduce the damage caused by future surprises but also improve institutional responsiveness. At the same time, our research points to a range of issues that should be further explored in order to do justice to the complexities of professional work and the institutions that foster it. Thus, the article concludes by indicating two pathways for advancement.

First, to reveal the strategies that are utilized in various ways in different professional settings, a further development of concepts that are sensitive to these differences are needed. It has been suggested that the perspectives developed by Haas and colleagues with respect to epistemic communities are relevant. In addition, communities of promise and communities of concern, founded on Adams' notion of "virtual real," also reveal aspects of what nurses do in different contexts and how their actions reflect different epistemic strategies, that is, how they develop. A refinement and expansion of the processes and practices of signing communities should rest on empirical research in the professions and lead towards the creation of a "heuristic" for knowledge strategies to deal with the unknown in their work. In particular, the processes involved, the kinds of events, social formations and political conditions that may lead to the emergence of new communities all need to be considered. Second, and closely related to this, is the following question: do the spread of non-knowledge and the core practice of signing subscribe to a specific form of professionalism, that is, can signatures be seen as expressions of an occupational professionalism that confirms that bottom-up control strategically defines what professions want to know and not know? Clearly, there is much to explore from the perspective of professionalism with respect to dealing with the co-existence of knowledge and non-knowledge.

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