Chapter 5.

Doing interprofessional simulation

Abstract

This chapter illustrate how the social and material arrangements for interprofessional simulation produces different conditions for learning. The first section focuses on the emerging medical knowing, affective knowing and communicative knowing in the socio-material arrangements of three locations involved in the simulation, i.e the simulation room, the observation room and the reflection room, during the course of events in the scenario. The second section focuses on emerging rhythms of collaboration. Different ways of relating to the manikin as a technical, medical and human body, and the relevance of these findings for simulation pedagogy are described.

5.1 Introduction

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What does it mean to do interprofessional simulation? Such a seemingly simple and innocent question is unpacked in Chapter 5 to reveal its beguiling nature. In this introduction my aim is to provide readers with cues, suggestions and tantalising glimpses, in the hope that these might foster a reading that is aligned with the authors' intended terms of engagement, and which draws out meanings and connections that might otherwise have been less obvious. Both sections offer analyses informed by sociomaterial theory, exploring how the doing of interprofessional simulation emerges in fluid relationships between different (human and nonhuman) actors. What follows highlights features of each, and connections between them in terms of multiplicity, messiness, and medicine.

Sociomaterial analyses resist reductive accounts of a singular 'truth', opening up instead to multiplicity. Anh and Rimpiläinen's work reminded me of Massey's (2005) ideas of space as a coming together of (multiple) trajectories or stories-so-far. In their account, the gaze is widened to incorporate spaces away from action around the simulator, and the entangling and coalescing of unfolding trajectories between them is clearly laid out. This is infused with another layer of multiplicity – that of knowings. Dahlberg and Nyström elucidate a multiplicity of simulated bodies, in which Mol's (2002) work on "real" patients' bodies comes to mind. They reveal a(nother!) multitude of more or less choreographed bodily assemblages, anticipations, and responses among the learners.

Just as sociomaterial accounts resist reductionism, they also resist the imposition or even expectation of coherence and linearity. Embracing mess reframes the analysis in helpful ways. Learning through simulation emerges in this chapter as both ruled and unruly. Ruled by social norms, pedagogic norms, curricular intentions, and technological affordances. But these rulings do not determine the unfolding practices. We see unruly intrusions – look out for injurious intubation, affect and sweating bodies, missed care for a head, the inscrutable manikin, and untended wounds.

Medicine provides a third productive point of connection between the sections that follow. Medical knowings are not limited to knowledge of the body and treatment, but also revealed in their performative aspects around (becoming) professionals' bodily positionings, and movements, and the things of medicine (look for the torch). Medical bodies appear in simulated form, requiring more than the simulator to take on this meaning, colliding with human bodies (look out for a tucked blanket). Medicine also forms trajectories of practice that synchronise (or not) with those of nursing. We can take this chapter as a basis to understand medicine and the medical in challenging but exciting ways.

Contributions to this book share a commitment to understanding simulation not as an end in itself, but as a means to foster learning. The literature of simulation as educational tool is striking in its largely normative and prescriptive nature. Both sections in this chapter show how learning emerges through but also in spite of the enactment of plans that follow dominant prescriptions of 'good' simulation

pedagogy. Interprofessional learning is indeed shaped by curriculum, scenarios, technologies, facilitator prompts and questions. But ruptures also emerge, and I encourage readers to seek out ghostly anticipations, unmet urgencies, deviations, spontaneous eruptions or closures of possibility (look for the technical breakdown). Through these, we can see how, for all possible prefiguration, fluid assemblages of the human and nonhuman defy complete control: learning remains deliciously open, unfinished and unruly.

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5.2 Location and Knowings

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5.2.1 Introduction

This chapter treats simulation as a means to fostering learning. We examine how learning and knowing emerge in the different locations - the simulation, control and reflection rooms - involved in the simulation training. The focus is on the varying socio-material assemblages in these locations and how they coalesce or fall apart affecting learning and knowing by the participants.

A number of meta-analyses of simulation studies (e.g. Cant and Cooper 2010; Cook et al. 2011) have shown that high technology-enhanced simulation training has a significant positive effect on learning, knowledge, skills and behaviour of medical and nursing students. Simulation training is also seen to be important teaching method to increase group performance, interprofessional communication and understanding, as well as satisfaction and confidence among the participants. High fidelity simulators are regarded to be especially suited for training students (and professionals) not only in technical and medical skills but also in non-technical skills such as team-building, leadership, communication and decision-making (e.g. Eich et al. 2007). Considering that communication between different groups of professionals in health care have been identified as significant in medical practices (Barr et al. 2005), high technology-enhanced simulation seems to be answer for various challenges in medical education. While there is a large body of knowledge that supports the view that high technology-enhanced simulation in health education is an effective teaching method, there is still lack of knowledge focusing on the process of students' learning and how knowledge emerges and manifests itself in the simulation training, which this chapter concerns.

5.2.2 Knowing as enactment

In this chapter we investigate "doings" and the types of knowing that emerge in the different locations involved in simulation training (see also Ahn et al. 2015). For analysis we have drawn upon an approach that belongs to the family of practice-oriented theories (see Chapter 2) useful for studying human-technology relations, Actor-Network Theory (ANT).The approach provides tools for analysing socio-materiality and disentangling how practices and their effects

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emerge - on this occasion, in a pedagogical setting (e.g. Law 2004; Latour 2005; Fenwick and Edwards 2010). Principles that guide ANT analyses can seem radical from the traditional social sciences' point of view.

Firstly, ANT argues that both humans and nonhumans can "act". ANT treats materiality, non-human actors, as equal participants in practices: the simulator is an as important actor in the exercise as are the students or their teachers. However, ANT makes a distinction between intentional action, and acting by "affecting states of affairs": objects "act" through being entangled in networks or assemblages with other actors (Callon 1986; Latour 2005). This is the way in which the simulator acts: it necessarily influences states of affairs as part of the socio-material entanglement that comes together to produce the simulation exercise. This chapter provides several examples of this.

Secondly, ANT departs from the traditional worldview which stipulates that the world, our reality, is something that simply exists out-there, ready to be observed. Instead, the world is seen as emergent, and as enacted into being through the different doings engaged by conglomerations of human and non-human actors. In other words, materiality and the social are inseparable from one another in producing the realities we live in. (e.g. Callon 1986; Fenwick and Edwards 2010; Law 2004; Latour 2005).

The main focus of this chapter is the concept of "knowing" (how you come to "know" something). ANT does not regard the phenomenon either as a cognitive or a social one (e.g. Sørensen 2009). Knowing emerges as an effect of the socio-material arrangements that gather together and are performed into being through the continual transactions, which are part of the practice (Law 2004; 2009; Rimpiläinen 2011; Sørensen 2009). In other words, knowing is an enactment. The crux of the concept of enactment is that these take place in physical locations, such as the simulation room at a hospital, and that they are inextricable from "doing". Enactments are achieved in, by and through the relationships among the diverse entities in those physical locations (Law 2009) Therefore, knowing as an enactment can be taken as a local and a temporal product. To understand how "knowing" emerges as part of the simulation, it is crucial to know which practices and which socio-material entanglements are involved in the process.

In this chapter, we follow the simulator as a focal actor in order to elaborate and understand how the patient Anna becomes enacted into being (or not) during the simulation exercises. Focusing analytically on the simulator enables us to zoom in on the "doings" taking place, who and what are involved in these doings, and crucially, what the *effects* of these assemblages and doings are (Mol 2002; Rimpiläinen 2012). By approaching phenomena following the principles of ANT, we shift the singular focus on human - customary in social science research - to *associations of human and nonhuman actors*, and upon the effects such assemblages have e.g. on producing and affecting our day-to-day practices. ANT

also helps us resist landing upon a singular truth, but helps us trace multiple, sometimes competing, realities.

5.2.3 Locations and materials of the simulation

5.2.3.1 Locations

The simulation training discussed in this chapter involves three different locations; simulation, control and reflection rooms (Ahn et al. 2015). The first location is the *simulation room* itself. The simulation training was arranged for mixed groups of nursing and medical students in the last semester of their education, with the purpose of carrying out full-scale simulations of acute trauma handling. The simulation room was furnished as an emergency room with medicines, medical equipment, furniture, an oxygen tank, gloves, a telephone, drips and computer monitors. In addition, there was a one-way window to the *control room*, which is the second location. The manikin functions through being connected to a computer run by an operator in the control room. The briefing preceding the exercise was done in both locations as the teachers and the operator informed the students about the scenario and materials/equipment involved in the exercise. All students could not participate in the simulation, partly because of lack of time and resources, partly due to large group sizes. Therefore, the students were divided into two groups: a team of five would participate in the exercise in the simulation room, with the rest of the students observing it in the control room with the medical teacher and the operator. The control room had a desk with a computer and three monitors; one displayed a silhouette of the manikin showing its bodily functions, while the other monitors showed the simulation room from different angles. There was a row of stools for the observers to occupy at the back of the room, giving a good view of the simulation room through the one-way window and through the monitor displays. Those in the control room could hear what was going on in the simulation room, but not vice-versa. The third location was a *meeting room* for debriefing following the simulation, where the student team that performed simulation and the students who observed the simulation gathered together to reflect upon the simulation. This room was furnished with small tables and comfortable chairs.

5.2.3.2 Scenario and the simulator

This section describes two specifics “things” or actors that brought the simulation exercise to life: the scenario and the simulator (Ahn et al. 2015). The scenario involved a young car accident victim, a 17-year old girl, Anna. The scenario had two elements: the medical case that was presented to the students, and another one that was embedded in the exercise.

The simulation exercise began with a briefing, during which the students were informed that Anna had been found unconscious at the scene of the accident, but that she had grunted a little during the transport to the hospital. She had no visible injuries except for some bleeding on the left side of her head. The ambulance staff had given her some oxygen and a neck-collar to protect her neck. This was all the information the students were given.

The embedded learning element would emerge during the exercise, provided the students followed the mandated medical procedure for treating an acute trauma case - the so called the "ABCDE" routine: to check Airways (Stage A), Breathing (Stage B), Circulation (Stage C), Do a neurological check-up (Stage D) and Exposure and environmental control (Stage E). If the teams followed the routine and repeatedly performed the different stages of the procedure each time a change in the patient's condition was detected, they would discover that Anna's condition was deteriorating rapidly, and that they needed to call for help engaging different colleagues from around the hospital.

The manikin has different configurations. The medical actions enabled by this version of the manikin included measuring the pulse, taking temperature, giving oxygen, inserting a catheter or inserting a drip on a patient's vein. The manikin is immobile, but it can be lifted and moved around. As the simulator it cannot respond to touch, the students received this type of information, such as the patient's reactions to stimuli, via a loudspeaker from the control room, where the simulator was being operated from. Additionally, the manikin's pupils could be changed manually, so that these altered in size. This was a crucial element of the simulation, as that indicated a change in the patient's condition.

5.2.4 Knowings and locations

The empirical material for this chapter was generated through observing 15 rounds of full-scale simulations of acute trauma in undergraduate education of health professionals in Sweden. The exercises were carried out by mixed groups of nursing and medical students. Each group was divided into two subgroups; a group of four-five students performed the simulation and the others observed the simulation from the control room. A research team of four members attended three training days. Each observation was carried out by two researchers, one taking notes in the simulation room, the other in the observation/control room. Both researchers attended the debriefing session following each simulation. Five of the simulation sessions were also video-recorded. Repeated observations of the repeated runs of the structured simulation exercise taking place in the same setting have allowed for a pattern or a "usual" sequence of events to emerge. This has enabled us to compare the different types of effects that have arisen as a result of the changing assemblages of the human and nonhuman in the different locations. (For more information about the study see Ahn et al. 2015)

The following section presents our main findings (Ahn et al. 2015). Through repeated rounds of observation of the simulation exercises, we discovered the emergence of different types of knowings: *medical knowing, emotional knowing, and communication*. These knowings made appearance in all three locations. However, due to the divergent socio-material entanglements in all three, the knowings emerged in different forms. The exercise that took place in the simulation room had dual function: we analysed it as a setting where different knowings emerged, while the exercise also became material for observation, analysis and reflection in the other two locations involved in the simulation. This is also the reason why the description of the simulation room is given more space in this article than the other two locations.

5.2.4.1 Simulation room

As a pedagogical space, the simulation room is a location for learning by doing. It is important to understand that there was an intended learning path embedded in the scenario used in the simulation and that it could only be followed when the team enacted the scenario as if the situation was for real, and therefore demonstrated their medical knowings as part of it.

The teams were encouraged to do "...whatever they needed to do as interns", and act as if they were in a real emergency situation, with the simulator a patient whose life they needed to save. The teams that were successful in enacting the simulator as the patient Anna and in following the intended learning path started immediately to act as if they really were working as interns at an emergency ward, preparing for the arrival of an acute trauma patient. From the word go, they would, for example, put on plastic aprons and gloves, and prepare medical equipment for the arrival of the patient. The most significant marker of the team's engagement with the scenario as-if-it-was-for-real was how they related to the simulator: for example, did the team talk to the simulator as they would to a real patient, or did they talk *about* the simulator like a piece of equipment? Teams that did the former usually approached the simulator saying things like "Anna, you are now at the hospital, you have been in a car accident. I am your doctor and will take care of you." These types of actions show how medical knowing emerges in the simulation site: through the team's performance related to the materiality of the simulation room, and through "suspending disbelief" (Essington 2010) and the treatment of the "as if" of the exercise as "as is". When the team succeeded in suspending disbelief during the simulation, this would also manifest itself when the team had to handle a vomiting patient that was wearing a neck rest. Here the test was whether the team would take care of the patient's head when turning the head to one side. For the simulator it made no difference whether its head was being supported during the turn or not; for the patient this would be crucially important. Another test arose when the team would discover the altered pupil size in the patient's eye following the first completed round of the ABCDE-routine: the dilated pupil indicating a life-threatening change in the patient's condition, signalling raised intracranial pressure and uncal herniation. Actions that arose

following this discovery also manifested the levels of medical knowing by the teams.

What is important to point out is that not all actions or doings taking place during the exercise were related to the intended learning path. Students *could* do many different things, such as intubate Anna, even though she was breathing normally, or insert a tube into Anna's nose. These actions did not hurt the simulator, but they would have been dangerous to be performed on a patient with a head injury. The way the teams related and interacted with the scenario and the materiality of the simulation room highlighted the level of their medical proficiency.

The moment that the team picked up a unilaterally dilated pupil in the patient's eye kicked off the most stressful part of the simulation exercise: the team faced a real emergency. At that moment the mood in the room often changed and a particular form of *affective knowing*, entailing expressing and handling feelings, values and emotions, emerged. This had to do with the emotional aspect of working in a high-pressure situation trying to save a patient's life and making decisions quickly and decisively. Handling that level of stress was an important experience. During many of the exercises we observed, it was obvious that team were experiencing high levels of stress and anxiety, uncertainty, sometimes even shame as well as pride. The students reported these emotions manifesting themselves as physical, bodily experiences such as sweating, sweaty and shaky hands, stomach pains, drying mouth, inability to think clearly etc. The emotions and reactions to the simulated situation were something that the students had not expected to experience during the exercise. At the same time, handling stress reactions like these is not something that can be learned by reading textbooks. The physical reactions also showed the degree to which the teams managed to suspend disbelief, and enact the simulator as a real-life patient, whose life was at risk, while in reality there was no human patient who could die as a result of the actions of the team.

The third form of knowing that emerged in the simulation room was *communication.* The purpose of the simulation exercise was to support interprofessional learning. The exercise was in the last semester of both medical and nursing programs, and it was the very first time the students from these programs worked together. Even if doctors and nurses would work side by side in their future professional lives, their education is separated. The ability for smooth interprofessional working has been pointed out as an important aspect for patient safety. The affordances of the manikin, what it can and cannot do, are important for the simulation and its pedagogical purposes. The fact that the manikin is unable to display any bodily reactions necessitates the doctors examining Anna to state clearly what they are doing at any given moment in order to receive any medical information from the operator. These theatrical and unrealistic actions are comprehensible within the site of the exercise, and necessary for the simulation to carry on. It is also a way for the whole team to *communicate* and *share* information on the patient in a very specific way. The affordances of the manikin

enforced clear communication not only between the team and the staff in the control room but also among the team members. The necessity for clear and effective communication is not at stake only between the team members (between doctors and nurses) but also between the team at the Emergency room and the other professions at the hospital (played by the operator and the medical teacher in the control room). During the scenario the teams were expected to call for assistance. Trying to get hold of an anaesthetist was one of the most important parts of the scenario in terms of effective communication. The exercise made it clear that if the doctor was not able to communicate the urgency and the nature of the situation clearly enough to the other person on the phone, whose own medical priorities were taking precedence in their mind, the arrival of the anaesthetist would be delayed with dire consequences.

In the simulation room, the different types of knowings - medical knowing, affective knowing and communication- were dependent on students' ability to suspend disbelief and act as if the situation was real. Within the material set up of simulation room, there were actions that were medically (in)appropriate and (im)possible. The ability to suspend disbelief and act as if the situation was real means therefore that the team would act *medically appropriately* for the type of injury and patient in question, even though sometimes their action would be artificial and only understandable for those involved in simulation training. For example, stating "I'll put on some lubricant" before rectal examination would not be necessary in an emergency room, but is necessary for the simulation to continue. The enactment of the patient was a result of the team's engagement in enactment of the scenario as if it was a real case. It necessitated that students not only used the available materials but engaged each other and worked with them in specific ways that were understandable and acceptable as part of the simulation (Ahn and Rimpiläinen 2018).

5.2.4.2 Control room

Control room was a space where students unable to participate in the simulation exercise observed the unfolding events accompanied by the medical teacher and the operator. They would sit in a school-like setting, observing the team's performance like a piece of theatre via a one-way window and three monitors that focused on the different aspects of the exercise. They could also see and hear how the teacher and the operator participated in enacting the scenario.

The most significant material for learning in this site was the performance that the students observed. Observation, not simply "seeing", is an action rooted in the practice that it takes place in. To understand what to observe, and how to understand what is being observed, the students need to understand simulation, and of its concerns, as a medical educational practice (Latour 1987). From the first moments of the exercise, the medical teacher guided and structured the students' observations by instructing them to follow the team's medical actions and their communication, or the medical comments they made during the simulation. The

medical teacher played different roles: whenever she entered the simulation room, she was a colleague (from somewhere else in the hospital) to the Emergency team, but while she was in the Control room, she was a teacher to the students. She tried to actively involve the students in the Control room with questions such as "At which stage are they now?", and with comments, such as "They did not take care of her head". The students could ask questions at any time during the simulation, and the teacher would often give them extra information about the situation, explaining how the patient was expected to react, or why they did not do as expected. They would also explain what different symptoms indicated in medical terms, while at the same time only giving descriptive information of symptoms to the team in the simulation room.

Affective learning for the students in the Control was also different. While they could not experience the affective side of being medical professionals trying to save a patient's life in an acute situation first-hand, they experienced what they observed. Some of the students could relate to the team's emotional experiences as observers. Later, the team's simulation become material for group discussions, questions and reflections.

If simulation could be described as performance, the control room was a backstage. The hidden part of scenario was present throughout the simulation. Beside the running commentaries on the team's performance, the observers could also see how the medical teacher and operator gave answers and communicated as a part of the wider "hospital", which the emergency room had access to via a telephone. When the team discovered the dilated pupil, they would call for support. Usually the doctor in the simulation room is looking for an anaesthetist, but it was always a midwife they had to talk to instead. The midwife (played by the Operator) would not want the anaesthetist (the Teacher) to leave for the emergency room before she had finished treating his patient. As long as the doctor did not require to talk with the anaesthetist directly, the midwife would offer to deliver a message. The operator, as the midwife, would summarize the message to be delivered but with missing important facts. While only the doctor in the simulation room could participate in this conversation, all students in the control room shared the whole conversation. More significantly, the operator and the medical teacher would explain why the conversation went in that specific way; people would not let the specialist go if it was not obvious that it concerned an emergency. Further, they explained how to deliver a message and the importance of checking that the other part understood the message. The case gave the students important lessons on how to communicate interprofessionally within the different practices in the hospital.

As a pedagogical site the control/observation room can be described as a unique combination of classroom, panopticon, backstage and the extension of the manikin as mind and bodily reactions of Anna (Ahn et al. 2015). The medical and affective knowing in this location emerged as discursive rather than experiential learning. While the simulation team performed their knowing by doing, both the medical

and affective knowings in the Control room were performed discursively, sitting side-by-side in a classroom-like situation, supported and guided by a teacher. By asking the relevant medical questions and providing the relevant answers to the teacher when she asked, by discussing happenings in the simulation as material for learning, the students' knowing emerged. Communication here had more tutorial character; the medical feedback on what the team in the simulation room were given in this room by the teacher. It was also spontaneous, including teacher's answers and comments, and sometimes quite critical noting which mistakes the team may have made.

5.2.4.3 The reflection room

The simulation exercise always had a happy ending: Anna's life was saved, and she moved on to other parts of the hospital. The simulator returned to be a simulator. All students, the teachers and the operator moved to a conference room for debriefing. In this site, seated in a circle with their professional clothes on, they reflected upon the simulation. Those who had engaged in the simulation talked about their experiences of it, how they had taken decisions and what they felt while taking care of the patient. The observer-students could comment on the simulator team's actions and professional behaviours and discuss how the team communicated and made decisions. In this space, the students were colleagues and the teachers were moderators of the discussion. Medical knowing was enacted in a discursive and reflective way. The team's performance became material for discussion, something that they could detach themselves from and that they could learn from. The Anna/manikin, as a physical object, was not present in the reflection site but the *effect* of her/it was there as a material for learning.

The affective aspect of simulation was one of the main discussion themes. While the simulation team described and shared their emotional experiences - something that had often come as a surprise to them - the observers contributed to discussion with their interpretations and observations on how the team had handled the situation, and how they might do better the next time. The teaching staff often shared their experiences and gave advice, such as the importance of the ABCDE structure, or using a notebook during an acute case.

Communication in the reflection room was characterized by a collegium. It might not be surprising that the observer-students changed their communication style most strikingly, when they were together with the team face to face. During the simulation, the students were separated, and therefore there was an appropriate distance between the team performing and the team observing. The comments made about the performance were perhaps more critical and more spontaneous. In the reflection room, both teams were together as colleagues, whose actions and decisions required understanding and respect. The focus was on collegial professional communication: how best to discuss and constructively comment on decisions and actions taken by one's peers? The teaching staffs also took this collegial role in the reflection room: rather than pointing out any medical mistakes

made in the simulation, they waited for someone to mentioned them. Otherwise mistakes were not taken up for discussion in the reflection room.

5.2.5 Conclusion

In this section, we have explored a setting for interprofessional learning, where the human participants have inhabited different roles and held different responsibilities. Our approach, however, has allowed us to transcend these roles and responsibilities and focus upon not only what the students learned but also on how the learning took place: how the different "doings" as part of the varying socio-material constellations of each location enabled different ways of learning as well as the emergence of different types of knowing. (Fenwick and Edwards 2010; Rimpilainen 2011; Sørensen 2009). The shifting socio-material arrangements in the three sites conditioned, guided, afforded and anticipated divergent actions and doings for learning. All three locations were pedagogical sites and the three types of knowing were observed in all three, but they were enacted in different ways.

The chapter highlights the importance of materiality in planning the pedagogical journey for the students. What traditional social science might deem as a "social" outcome, something that emerges solely from human interaction, is in fact a result of careful manipulation of the available materiality in the learning locations within which the humans find themselves. The materiality in the three locations guided, even dictated, the way in which students and the teaching staffs engaged with each other, with the learning matter, the simulator, how they were able to participate and contribute to the exercise, and how they learned. While the different material arrangements in the simulation were created with a particular pedagogical intention in mind, these could also in turn create boundaries for propriety – for what kinds of actions were possible, acceptable and understandable for those involved in each location (see Ahn and Rimpiläinen 2018).

- All three simulation locations - the simulation, the control and the reflection room - are important pedagogical spaces but the nature of knowing and learning outcomes differ.
- The article highlights the importance of considering the materiality in planning pedagogical journeys for students, and how manipulating the scenario and socio-material settings of the simulation can impact learning outcomes.
- The socio-material arrangements made available in the different locations enable as well as de-limit possible (acceptable for the situation) types of actions, roles and communications.
- Approaching an interprofessional training session through Actor Network Theory has enabled us to transcend the differences between medical and nursing students, and instead focus on jointly performed practices, and the emergent effects of that activity. This has offered a fresh way to examine how learning takes place during a simulation exercise.

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5.3 Bodily enactments in interprofessional simulation

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This section will problematise how interprofessional collaboration can be understood through a focus on different enactments of participating students. We will provide empirical analyses of how the social and material arrangements for interprofessional simulation produces different conditions for learning (Nyström et al. 2016). We argue that a focus on the emerging practice is useful to disentangle the complexity of simulation and has a potential to provide new knowledge on how interprofessional collaboration is played out in practice.

Previous studies have predominantly focused on participants' opinions of interprofessional simulation as a means of learning interprofessional collaboration, or as part of course evaluative frameworks (e.g. Alinier et al. 2014; Cook et al. 2011, Gough et al. 2012). Following a socio-material perspective on practices, our starting point is that practices are emergent, and situated to a specific location in time and space. This means that we are looking beyond taken-for-granted understandings of interprofessional collaboration and ways of conceptualising simulation as following a certain protocol. Instead, we ask: What is happening as students come together to practice interprofessional teamwork in simulated emergency scenarios? How is the unfolding practice related to the ways the simulation setting is arranged? According to Schatzki (2002), material arrangements prefigure the emerging practice. This means that material arrangements, for example in the emergency room, influence what will be performed, and consequently make some actions easier to take, or follow, than others. Important for our analysis is also issues of corporeality, i.e. the significance and role of the enactment and positioning of bodies; the patient's body and the students' bodies as their interactions and collaborations unfold. Corporeality is regarded as an important dimension of what it means to be, to practice and to learn as a professional, that have implications for professional education (Green and Hopwood 2015). Recent theorisations of practice (Kinsella 2015) have suggested that a focus on the role of the body in professional practices, in simulated or naturalistic settings, might enable educators and learners to draw attention to other dimensions of knowledge, that are not easily accessible through cognitive perspectives, "dimensions that might help us illuminate, understand and investigate other types of knowledge that are relevant to everyday practices" (Kinsella 2015, p. 294).

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As previously mentioned in 3.2, a cycle of simulation pedagogically follows three phases: briefing, simulation and debriefing. These phases have different sociomaterial arrangements and activities that encompass different challenges to educators and learners. The locations of the different phases of a simulation exercise are not just 'contexts' or 'containers' where learning takes place (Ahn et al. 2015; see Chapter 5.2). In this section, we take the analysis of what is emerging during the unfolding scenario further, studying how the simulation scenario unfolds in practice (Nyström et al. 2016). Here we include a focus not only on the locations *per se*, but how the social and material arrangements for interprofessional simulation produces different conditions for learning.

This section builds on empirical analyses of video recordings from sessions where undergraduate nursing and medical students do simulation exercises that aimed to provide opportunities to practice professional skills as well as teamwork and collaboration (Nyström et al. 2016). Students are introduced to different scenarios of emergency situations, where the condition could be unalarming in the beginning, but the patient is deteriorating as the scenarios progress. A purposeful approach to collaborative data analysis, comprising a layered process in three phases of activities (see chapter 3.3), was utilised employing a field study approach. Ethnographic field studies have a long tradition of focusing on cultures and materiality and are also seen as in being in alignment with a sociomaterial perspective on practices (Fenwick et al. 2011; Schatzki 2012).

5.3.1 Enactments of the patients' body

Our findings show that students and student teams relate to the manikin in different ways as the scenario unfolds (Nyström et al. 2014, 2016). This means that students enact the manikin as multiple bodies, changing - depending on the issues raised in the scenario. Multiple enactments of the manikins' body were also found in a parallel project study by Hopwood et al. (2016; see Chapter 2). In the following, we will show how the manikin is enacted as a technical, a medical, and a human body, all of which are relevant and related to the development of the scenario. The ways students engaged with the manikin, and the tasks they were enacting reflected some of their specific professional roles and responsibilities but were also enacted as incentives to initiate or co-ordinate collaborative efforts. It was noticeable how students related to the manikin as a technical body, a medical body and a human body as the scenario was unfolding.

Enacting the manikin as a *technical body* was emerging in the briefing phase of the simulation, when the technical features and affordances of the manikin was presented. The technical body also came into play through the way's students performed the various examinations during the scenario in accordance with the affordances of the manikin. Examples of the adjustment of the examination to the

technical body are the insertion of a peripheral venous catheter that needed to be performed on the right arm of the manikin. The briefing session also included the technical limitations for what could be physically examined. The manikin was breathing and answering to direct questions, but the inspection of injuries was impossible. The students were instructed to ask questions about the clinical data that they needed. The answers from the manikin and the clinical data was provided through a loudspeaker voice from the control room.

Students were also enacting the manikin as a *medical body* as the scenario unfolded. This enactment was foremost initiated by the medical students and were visible in the ways the clinical procedures were emerging. The theoretical medical knowings, of anatomical structures and the assessment of bodily functions in regard of injuries was displayed. Decisions followed by actions to ensure the medical status and safety of the manikin as a medical body.

A third way of enacting the manikin, as a *human body* emerged in the way students addressed the manikin as a person. Students were calling the manikin by the name of the patient in the scenario and informing her about what the next action of the team what supposed to include. The attunement to the manikin as a human body also showed the ways students were caring for the manikin. This enactment was foremost initiated by nursing students, and were visible in the ways the manikin, now patient, was cared for to make as comfortable as possible. Examples of this include touching the patient's arm while talking to her or tucking a blanket around the feet to keep her warm.

The ways students interacted with each other and the social and material arrangements of the situation showed how ATLS protocol (ABCDE) acted as an algorithm for the emerging teamwork, prioritizing attunement to the medical body over the human body. The protocol thereby also coordinated how the profession-specific roles and responsibilities were interfoliated with the interprofessional collaboration around the emerging events of the scenario. Our findings show how the manikin was enacted both as a piece of equipment and 'as if' it was a real patient.

According to Schatzki (2002), material arrangements prefigure emerging practice. The material arrangements in the emergency room make some actions easier to take or follow than others. Our data show that an unplanned technical failure in the equipment running the manikin prefigured the actions taken, defining the "as if" simulation situation as a de facto "as is" situation. An example of this is (site 1 – simulation 4) when the manikin/patient stopped breathing. All students dropped everything and focused on resuscitation. Then, in the speakers, students heard the instructor say, "The patient is breathing, so continue as first planned". This example shows how a technical breakdown of the simulator made the students react as if it was the human body failing. The instructors' comments re-directed the students' attunement to the predetermined, agreed up on scenario.

5.3.2 Interprofessional collaboration as knowings and enactments

In this section, we will discuss how interprofessional collaboration can be understood through a focus on different enactments of participating students. We want to emphasise and recognise that the role of the body in knowledge production in practice since it goes beyond a focus on the individual practitioner. In line with Kinsella (2015), we will argue that the performance of a practice is constituted by the relational nature of material arrangements and professional bodies. Above we showed that nursing and medical students demonstrate their respective professional knowings in their enactments of the manikin as a medical and/or human body. In this section, we will discuss how interprofessional knowings and enactments were emerging as fluid movements. Below, we illustrate how these movements flow between *bodily positionings in synchrony* and *bodily positioning out of synchrony* in relation to the sociomaterial entities as well as the arrangement of the simulation room.

5.3.2.1 Bodily positionings in synchrony

> *The patient (the manikin), who has a head trauma after a car accident, starts to vomit. The medical student in charge of the patient directly steps up and secures the head and says, "We need to turn Anna. Position yourselves!". The second medical student and one of the nursing students move to the same side of the patient, secure the arm with the catheter and prepare to turn the patient. The medical student at the head then says 'On the count of three! One, two, three'. Simultaneously they turn Anna and the second nurse puts a bowl in front of Anna's mouth. The second medical student moves to the head and secures the airways. Once the patient is stabilized, still on her side, the second medical student moves again to investigate the back and spine for injuries, after which the patient is turned back to the original position. (Site 1 – simulation 3)*

The transcribed video sequence above shows a chain of actions of interprofessional collaboration composed of different doings in interaction between the students. We argue in the study that when bodily positionings were in synchrony with the sociomaterial arrangements in interprofessional collaboration, the movements of the student team members were connected in a fluid chain of actions. The activities of the chain comprised *noticing* a sign indicating a deterioration of the patients' condition (auditory or visual), which was followed by enactment of leadership through *taking action or* responding through *attuning to the action of others*. In the attunement to the action of others, there was also *anticipation of the next action* in the way the material arrangements were related

to (Nyström et al. 2016). For instance, when the medical student intended to test the eye reflexes, the nurse was handing over the torch, before the medical student had verbalized the intentions. The pattern of the collaboration is illustrated graphically in figure 5.3.1.

(Insert Figure 5.3.1 about here)

For the interprofessional collaboration to take place the study shows two important aspects how the leadership is taken, and how others respond. In the field note above, the leadership was executed when the patient's condition suddenly deteriorated, for instance when the unconscious patient starts to vomit. On a signal from one student, all members of the team reorganised their activities to one central purpose, to support the breathing of the patient. Here professional bodies are relating to each other in a manner described as "in sync", which demonstrates how the different activities are interrelated. When bodily positionings were in synchrony with the sociomaterial arrangements in interprofessional collaboration, the movements of the student team members were connected in a fluid chain of actions.

Another such example of leadership is how the nursing student in the team-initiated hand wash and putting on gloves and disposable aprons while waiting for the patient to arrive in the ambulance transport. Without saying anything, all members on the team responded to her actions, as the actions reminded them that this is a scenario where we play the "full game".

These examples show how sayings and doings, as well as bodily movements are connected to materiality. The nursing and the medical students both enact their respective professional knowings and tasks in relation to the patient but through the synchronization of the bodily positions, their sayings and doings of the critical situation also enacts interprofessional knowings. The enactment of bodily positions in sync showed that when the medical students performed their tasks, such as palpating the pulse and reporting the rate, the nursing students anticipated the coming action by the medical students and handed them the necessary material equipment such as a torch or an oxygen mask. The interprofessional relationship between the medical and the nursing students was bundled with material entities, present or imagined in the location for the scenario.

The chain of action was composed of different doings in the interaction between the students. This continued until the patient was stabilized, and the members of the team turned back to the activities they had abandoned. Doing professional activities independently is described as "out of sync".

5.3.2.2 Bodily positionings out of synchrony

When bodily positionings were out of synchrony with the sociomaterial arrangements, the fluidity of movements became disconnected by *task focused* performance and *dual agendas*. Noticing signs of deterioration and taking action did not lead to immediate attunement to the action of the others or responding through anticipation of the next step. Instead, the pattern of movements showed that parallel professional enactments without connection were taking place through the enactment of designated professional actions.

> *The nursing students stand in one corner of the room discussing how and when to prepare a urinary catheter. The two medical students stand in another corner of the room, looking for medical dosages in a drug compendium./.../After a while the medical students decide that the patient urgently needs to be transported to the X-ray room. The nursing students stop preparing the urinary catheter and help prepare the patient. (Site 1 – simulation 2).*

One example of this is in the field note above, where the nursing students and the medical students are separated in parallel professional enactments, both in their professional doings, sayings as well as physically in the room. Then the medical student takes the lead and the nurse student react to this despite that they cannot complete their planned action. By these sayings and doings, the chain of actions was eventually connected again by enactment of leadership, making dual agendas coalesce.

This type of interprofessional collaboration is also illustrated graphically in Figure 5.3.2.

(Insert Figure 5.3.2 about here)

In our study, we saw other examples of bodily positionings being out of synchrony, how the participants were focusing on task-focused actions. In the field note below, a nursing and a medical student are going to suture a patient who has a wound on his leg. The medical student is all focused on following the protocol in a search for the problem. The nursing student is focused on the task given as well as preparing to take care of the patients' wound. This is another example where there are parallel professional enactments but in this example there are only brief moments of collaboration between the medical and the nursing students. This is illustrated graphically in Figure 5.3.3

> *... come into the room and there is nothing 'alarming' about the patient, but the medical student directly starts to go through the procedure of ATLS, declaring that they have a*

clear airway, the lungs sound good and that they need to get a blood pressure reading. The nursing student tries to prompt the medical student that they need to suture the wound, but the medical student does not listen. The patient says, 'Why are you doing all these examinations on me? I'm not sick…'. The medical student answers 'No, no, we are just examining you and soon we are going to take care of your wound.'. She proceeds with her examinations following the ATLS protocol. The nursing student assists when requested, measuring the temperature etc. Otherwise the nursing student remains quiet but starts to prepare for the suture by arranging gloves and aprons, and a tray with syringe, anaesthetic and bandages. When the medical student has completed the examination according to the ATLS protocol she focuses on the wound and asks the patient if he has been anesthetized before. The patient does not really know. The medical student asks the nurse to bring out the adrenaline 'If something would happen...'. (Site 2 – simulation 3)

(Insert Figure 5.3.3 about here)

5.3.3 Discussion

In this section, we have applied a practice theory perspective on what is happening as students come together to enact interprofessional teamwork in simulated emergency scenarios. An important finding was how the students' knowing-in-practice was embodied and relational to the enactment of the manikin as body in different ways. The students shifted their attunement to the manikin/patient's body as being a technical, medical or human body. These shifts demonstrate how students' actions and interactions within the simulation are entangled with material arrangements. One plausible interpretation is also that the shifting attunements to different enactments of a medical or human body encompass possible fragments of professional perspectives of doctors and nurses in play. Students' attunement to the manikin/patient as a technical body was intentionally related to the material arrangements of the simulation that required the participants to perform certain activities in ways that the technology allowed. However, the findings also demonstrate that the breakdown of the technical body the students to intentionally relate to the manikin as being a medical and human body.

Interprofessional collaboration in the simulation room was enacted as bodily positionings in and out of synchronization in a fluid way. Students' bodily positionings emerged in relation to the sociomaterial entities as well as the arrangements of the simulation room. When in sync, the students performed and enacted interprofessional collaboration where sayings, doings and bodily movements were connected in a chain of actions. Typically, when chains of actions were connected, and in sync, interprofessional collaboration emerged through the way they enacted their respective professional knowing in the context of others'. Participants were attuned to leading or responding to others' sayings and doings. When chains of actions were out of sync, the bodily movements were disconnected, creating parallel professional enactments. These findings could be related to what Johnson (2015), in a dynamic perspective on practice and practicing bodies, has described as 'enacted and embodied rhythms to practice' that generate a periodicity that enable practitioner to construct their practice together. There are multiple rhythms of various kinds in a practice, and these help the practitioners to sort the choices of actions undertaken. Johnson (2015) suggests that the sensitive synchronisation of practitioners' bodily actions and understandings is what shapes their professional practice.

5.3.4 Conclusions

The findings of this study can contribute to the development of simulation pedagogy for interprofessional learning with students. Bodily positionings direct educators' attention to the fluidity in movement. The articulation of bodily positionings in and out of synchrony can be used to disentangle the complexity of the interprofessional simulation and emphasize the collaborative part of the simulation. Bodily positionings were in synchrony when interprofessional collaboration was connected through noticing a sign indicating a deterioration of the patients' condition (auditory or visual), enactment of leadership through taking action, or responding through attuning to the action of others as well as anticipation of the next action of a peer student. Bodily positionings were out of synchrony when the fluidity in students' movements became disconnected by *task focused* individual performance and *dual agendas*. These phenomenons are related to contemporary theorisations of practice comprising an integrated view of body and mind. Being aware of this, designers of simulation exercises for interprofessional student teams should be able to support learning in new ways.

In this section of Chapter 5.3, we have discussed that

- the student teams doing simulation relate to the manikin as a technical, medical, and human body, and that
- interprofessional knowings and enactments emerge as a fluid movement between bodily positioning in synchrony and bodily positioning out of synchrony in relation to the sociomaterial arrangements.

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5.4 Commentary

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At first glance, this chapter, *Doing interprofessional simulation,* would appear to focus on the 'doing', on the practices of enacting simulation and the richness available to analysis and learning when one pulls apart a simulation and asks questions about how it is done, how the communication between participants (especially those from different professional categories) is conducted, and what moments of rupture can offer participants and trainers.

But on closer reflection, the insights from this chapter are also very attuned to the material of the sociomaterial in simulations and the emergence of patient bodies and interprofessional communication around them in different contexts. Here the authors are inspired by Mol's work on multiple ontologies (Mol 2002), which speaks to how diseases and bodies can be enacted in difference sociomaterial constellations. The authors of this chapter engage praxiographical approaches to show how simulator bodies and medical needs are multiple and emergent.

The chapter begins with a contribution from Anh and Rimpiläinen which draws our attention to the places in which knowing emerges from simulator training. They bring us into the simulator room, the control room and the reflection room where debriefing occurs. Through close analysis of the discussions that occur in each, they show us how the simulated patient is enacted into being through sociotechnical assemblages – through looking at who and what are involved. Their close readings give voice to the way medical knowledge, affect and interprofessional communication are all forms of knowledge that emerge in the simulation.

In the second section of the chapter, Dahlberg and Nyström describe how student teams relate to the simulated manikin as a technical, medical and human body in fluid movements in and out of synchrony with the sociomaterial constellations of the simulation. Their work shows how important it is to consider affordances that the constellations of technologies and human bodies provide when examining the unfolding simulation. Here, too, the enactment of the patient is studied, with specific interest in the bodily positionings of human and nonhuman participants.

Both sections of this chapter engage with simulated bodies as sociomaterial actors. A fertile parallel to their approach can be found in Goodwin's work, which shows that the real patient body is also a sociomaterial actor (Goodwin 2009), a human-technical entanglement which requires interprofessional communication to read

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and know. Human patients are also mediated through technology, just as their simulated counterparts are. The agency of both is relational. One of the lessons drawn from research on the emergence of sociomaterial ontologies and the practices between human and nonhuman actors is the importance of analytically considering agential relationality. While ANT suggests that both human and nonhuman actors can be attributed agency, Suchman's reflections on this encourage us to remember that it matters where and how we draw the lines between humans and nonhumans (Suchman 2007). Viewing agency as relational prompts analytical interest in how it is produced, how it emerges. The work presented in this chapter shows what richness this theoretical approach can provide to studying interprofessional communication as it emerges around simulated (and by extension in non-simulated) sociomaterial, human-technical entanglements that we call patient bodies.

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Figure captions

Figure 5.3.1. Interprofessional collaboration between nursing (N) and medical students (M) as bodily positionings in synchrony with sociomaterial arrangements.

Figure 5.3.2 Interprofessional collaboration between nursing (N) and medical students (M) as bodily positionings out of synchrony with sociomaterial arrangements. Dual agendas coalesce.

Figure 5.3.3. Interprofessional collaboration between nursing (N) and medical students (M) as bodily positionings out of synchrony with sociomaterial arrangements. Both professional groups have a task focus.