



**Trail blazing or jam session?
Towards a new concept of clinical decision-making**

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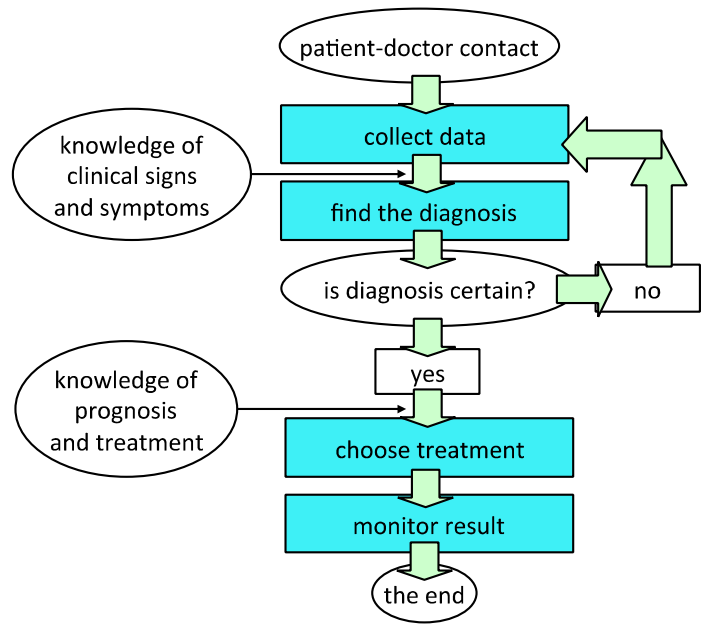
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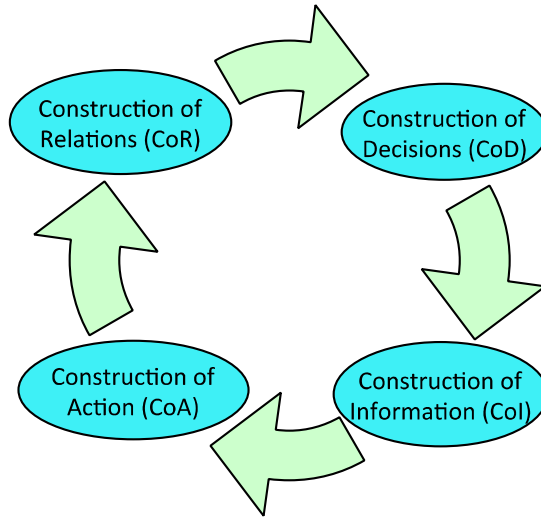
Risør: Trail blazing or jam session?

Figure 1. Clinical decision-making¹



¹ The model is translated for the purpose of this presentation

Figure 2. The constructions of clinical decision-making



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Trail blazing or jam session?

Towards a new concept of clinical decision-making

Abstract

Clinical decision-making (CDM) is key in learning to be a doctor as the defining activity in their clinical work. CDM is often portrayed in the literature as similar to 'trail blazing'; the doctor as the core agent, clearing away obstacles on the path towards diagnosis and treatment. However, in a fieldwork of young doctors in Denmark, it was difficult connect their practice to this image. This article present the exploration of this discrepancy in the heart of medical practice and how an alternative image emerged; that of a 'jam session'. The exploration is represented as a case-based hypothesis-testing: First, a theoretically and empirically informed hypothesis (H0) of how doctors perform CDM is developed. In H0, CDM is a stepwise process of reasoning about clinical data, often influenced by outside contextual factors. Then, H0 is tested against a case from ethnographic fieldwork with doctors going through internship. Although the case is chosen for characteristics that make it 'most likely' to verify the hypothesis, verification proves difficult. The case challenges preconceptions in CDM-literature about chronology, context, objectivity, cognition, agency, and practice. The young doctor is found not to make decisions, but rather to participate in CDM; an activity akin to the dynamics found in a jam session. Their participation circles in and through four concurrent interrelated constructions that suggest a new conceptualization of CDM; a starting point for a deeper understanding of actual practice in a changing clinical environment.

Introduction

Like being thrown off the Moon into empty space... You just start from Day One and have to make a lot of decisions... where you think: Jesus, right? And a lot of logistics you also have to fight with... (Birgitte, doctor in internship)

1
2
3 The quote is from my fieldwork with doctors in internship in Denmark, their first assignment as
4
5 doctors after finishing medical school. The challenge of decision-making that Birgitte introduces
6
7 became a central theme in the fieldwork as a core activity in doctors' work, but also as a core
8
9 process through which doctors grew into a new identity as professionals (Risør 2010).
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14 In internship, a doctor works primarily with patients as they enter the clinic with a new and acute
15
16 health problem. This situation is almost archetypal for medical understanding of clinical decision-
17
18 making (CDM) (Eva 2004; Norman 2005). In the course of fieldwork, however, I found it
19
20 increasingly difficult to connect the theoretical medical literature on CDM to the empirical cases
21
22 observed in various clinical settings. Here, I wish to outline the key difficulties in connecting
23
24 medical theory and practice in this field, and use these to suggest a reconceptualization of CDM
25
26 that may strengthen the theoretical framework for future studies. Through the analysis of a
27
28 clinical case, I test the applicability of a decision-making model (described below) exemplifying
29
30 current understanding of clinical decision-making in medicine.
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36 **Internship for doctors**

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38 Internship¹ constitutes a critical phase in formal and non-formal medical education (Brinchmann-
39
40 Hansen 2004; Henriksen, et al. 2003; Petersson, et al. 2006). It is a transition from going to
41
42 university to going to work, from being a student to being a doctor, from learning from books to
43
44 learning from practice (Akre, et al. 1992; Brinchmann-Hansen 2004). This transition is difficult
45
46 both professionally and personally for the doctors (Petersson, et al. 2006; Vikanes, et al. 1992).
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49

50
51 ¹ I use the terms *intern* and *internship* rather than the Scandinavian terms *turnus doctor* and *turnus education* for several
52 reasons. One is that it is less cumbersome, another that it is the term most widely used internationally to describe a
53 young doctor who has recently finished university education. The term *turnus doctor* does have some interesting
54 connotations, however, that are lost when speaking of interns. Turnus refers to the circulation between different
55 departments taking *turns* at each. The very term therefore signifies that the turnus doctor is a temporary resident in
56 this particular setting. After turnus, the doctors in Denmark usually goes on to work in an introductory position,
57 more semantically in line with the term *intern*, referring to being let *in* to the clinical space rather than just observing
58 it or passing through.
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3 Incidence is high for stress, anxiety and isolation among interns (Henriksen, et al. 2003;
4
5 Petersson, et al. 2006); they feel uncertain, incompetent even, about their clinical knowledge and
6
7 skills (Mørcke and Eika 2002; Ringsted, et al. 2002), and marginalized from being in an unknown
8
9 social environment unsure of the unspoken rules of behaviour and expression (Bayer, et al. 2003;
10
11 Petersson, et al. 2006).²

12
13
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15
16 Such a period – of being betwixt and between (Turner 1966)³ – is likely to produce significant
17
18 changes in the individual trying to adapt to these changes and create a new social and
19
20 professional identity (Slotnick 2001). It is plausible that internship also has a significant effect
21
22 upon how doctors make decisions.
23

24 25 26 27 **Clinical decision-making**

28
29 A possible step to better understand CDM in internship is to develop a relevant conceptual
30
31 framework from which to perform studies of CDM in the practice of young doctors. The book
32
33 “Clinical Rationality” may serve as a starting point. It is a recognized textbook in the field of
34
35 clinical rationality. Wulff structured his book on a now widespread model of the process of
36
37 CDM. The first edition was published in 1973 (Wulff 1973), the 5th edition in 2006 (Wulff and
38
39 Gøtsche 2006). Originally published in Denmark, the book was translated and published in a
40
41 number of countries, receiving widespread acclaim. The English edition is mentioned as one of
42
43 the important inspirations for the authors of *Evidence-Based Medicine – How to Practice and Teach*
44
45 *EBM* by Sharon E. Straus et al. (Straus, et al. 2005).
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55 ² The literature chosen for this paragraph is Danish and Norwegian; chosen because the fieldwork is from Denmark.
56 However, the findings about medical interns have been reproduced elsewhere in Europe and North America.

57 ³ Turner’s work – a classic in anthropology, but much less known in medicine – describes how initiates in rites of
58 passage find themselves ‘between’ what they were and what they will become; a state of ‘betwixt’ where they are
59 neither one, nor the other. In this case: No longer a student, but not quite a doctor either.
60

1
2
3 In the model, the clinical decision is described as a process where data is collected, the diagnosis
4 is made, a relevant therapy is selected and the outcome monitored (see Figure 1). At specific
5 points of this process, the doctor applies his knowledge of the clinical picture of different
6 diagnostic categories and his knowledge of prognosis, given different kinds of treatment, for this
7 condition. Wulff describes the model as a 'very simplified image of the process of decision-
8 making'. In particular, he mention that the expert and the novice have different patterns of
9 decision-making; that hermeneutic and ethical considerations may modify the process; and that
10 chronic disease may call for more long-term decision-making (Wulff 1987):
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22 *Figure 1. Clinical decision-making⁴*

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24 *(insert Fig1 here)*
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29 Scholars have described different ways to perform CDM, but with the same basic elements as
30 Wulff. The most prevalent and studied ways are 'hypothetico-deductive reasoning' (HD) (Elstein,
31 et al. 1978) and 'pattern recognition' (PR) (Schmidt, et al. 1990). HD is the process of creating
32 hypotheses and seeking to support or falsify these through deductive reasoning. HD is found to
33 be used by most doctors, but mostly when they address a new problem. PR is a process, which
34 seems to develop with accumulating experience. Once a certain problem has been experienced
35 and dealt with, the process becomes a recognizable pattern, which makes it easier to recognize
36 this pattern and variations thereof in another patient. Both of these refer to the diagnostic
37 process, the part of decision-making most studied (Norman 2005).
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50 Other ways of CDM include 'rule-using', 'heuristics', 'intuitive', 'event-driven', 'algorithmic', 'rule
51 out worst case scenario', and 'exhaustion' (Sandhu and Carpenter 2006). A strategy which seems
52 to gain increasing support is 'scheme-induction reasoning' (SD) (Coderre, et al. 2003). SD refers
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58 ⁴ The model is translated for the purpose of this presentation
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3 to generalized descriptions and flowcharts on how to deal with a specific problem: If this and this
4
5 factor is present, you should do this and this. All these strategies can roughly be divided into
6
7 'analytical' and 'non-analytical' reasoning (Eva 2004), with HD as an example of analytical, and
8
9 PR as an example of non-analytical. Both approaches are, however, thought to progress through
10
11 the same general stages shown in the Wulff-model; the difference being primarily in the doctor
12
13 using conscious reasoning or experience-based intuition to perform each task.
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18 Numerous studies, however, indicate that clinical choices or decisions, whether diagnostic or
19
20 therapeutic, are associated with many factors outside the domains of 'data/findings' and
21
22 'knowledge/experience'. Feldman et al. found that 'medical decision-making – ideally a matter of
23
24 symptoms, tests, and probabilities – is in fact a social transaction prone to medically extraneous
25
26 influences. These nonmedical factors include personal characteristics of both patient and
27
28 physician, as well as organizational characteristics of the setting where healthcare is delivered'
29
30 (Feldman, et al. 1997). A particular subtle set of contextual influences may be labelled 'cultural'
31
32 (Bates, et al. 1997). The concept of 'context' as non-medical factors that influence the process of
33
34 clinical reasoning was examined by Durning et al. who found clinical reasoning a process with
35
36 'content specificity' – the clinical reasoning is at the centre - but influenced by outside contextual
37
38 factors (Durning, et al. 2011).
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44 From this literature, this definition of clinical decision-making emerges:
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49 CDM is a series of steps in which the doctor obtains the relevant data about the patient,
50
51 performs a process of reasoning using knowledge and experience, and, often influenced
52
53 by contextual factors, reached a decision, first about possible diagnoses and then about
54
55 the relevant therapeutic actions.
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3 An image for the doctor's role in this kind of decision-making could be 'trail blazing', where a
4 person traverses unknown territory, clears the path for obstacles and leaves markers for others to
5 follow. For each patient, difficulties in finding the way towards diagnosis and treatment must be
6 cleared, and the path followed must be documented in the patient's file to assist the next doctor
7 who sees the patient.
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13 **Fieldwork in internship**

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16 In 2007-2008, I did ethnographic fieldwork in Jutland, Denmark. The purpose was to explore
17 how young doctors learn to make clinical decisions in their everyday work as clinicians. I
18 followed a group of nine doctors⁵, from the time of medical graduation and through 18 months
19 of internship; 5 women and 4 men in the age 27-32. Internship was divided in three; 6 months in
20 surgery, 6 months in internal medicine, and 6 months in family medicine⁶. In total the interns
21 worked in 13 different hospital departments in 4 hospitals and 9 family medicine clinics. I was
22 with the interns at work for 1-2 days every 3-4 months (~350 hours) and did semi-structured
23 interviews shortly after each observation period, concerning patients they had seen (~47 hours).
24 The fieldnotes from being with the doctors at work and the transcripts of interviews make up the
25 empirical material of the study.
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42 Whenever a diagnosis, a diagnostic test, or a therapeutic action was entered into the patient's file,
43 this was taken as a decision. Fieldnotes from the situation represented in the file were used to
44 describe the situation in detail, and this description + the patient's file were used in the interview
45 with the intern about decision-making with this particular patient. The intern in the interview had
46 the text from the patient's file as a memory probe of the clinical encounter. The three texts thus
47 produced – the fieldnotes, the patient's file, and the transcription of the interview – were then
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56 ⁵ I sent a letter of invitation to the 51 doctors starting out in internship in a particular region. I then phoned potential
57 informants from the top of the list. After 16 contacts, 12 had agreed to participate. From these 12 potential
58 participants, I chose 9 from a list of criteria meant to further maximum variation sampling.

59 ⁶ This was until 2009 the standard internship for all Danish MDs. Now, internship is reduced to 12 months.
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3 integrated to a fourth text – the case. One case – the case of the intern Birgitte and the patient
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5 Kim – is presented below.
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9 The project was approved by the Faculty of Health Sciences, Aarhus University. National rules
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11 about data-management were observed. The interns gave their consent to participate. Obligations
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13 as a medical doctor were observed in accordance with the principles of the Danish Medical
14
15 Association and Danish medical law, including doctor-patient confidentiality.
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20 **Case-based hypothesis-testing**

21
22 The case of Birgitte and Kim below is used here in hypothesis-testing as described by Flyvbjerg
23
24 (Flyvbjerg 2006; Flyvbjerg 2011). The key in this process is the strategic selection of a case, here
25
26 an *information-oriented selection* where cases are chosen for their potential information-content in
27
28 contrast to ‘random selection’ where cases are chosen for their potential generalizability. Of the
29
30 four ways of information-oriented selection described by Flyvbjerg – extreme/deviant, maximum
31
32 variation, critical cases, paradigmatic - the critical case was chosen. This satisfies the condition “If
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34 it is valid for this case, it is valid for all (or many) cases”. A critical case can be chosen either
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36 because it is “most likely” or “least likely” to either confirm or falsify propositions and
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38 hypotheses. The hypothesis I wanted to test was that “The definition of CDM (above) is a valid
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40 representation of clinical decision-making practice”. In medical literature, the hypothesis being
41
42 tested is usually referred to as the *null hypothesis* (H_0)⁷.
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49 Here, I chose a critical case to be “most likely” to verify the null hypothesis. The examples used
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51 in studies on clinical reasoning are almost always about the admission of a new patient to the
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53 internal medicine reception ward at the hospital; the patient having an acute medical problem,
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56 ⁷ I should note that I do not pretend this to be equivalent to a statistical testing of a null hypothesis. I use the term to
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58 signify the hypothesis given attention as the centre of scrutiny. In the conclusion, I try to qualify what kind of
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60 conclusions can be drawn from this kind of testing, in line with the methodology developed by Flyvbjerg.

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3 and the doctor meeting the patient for the first time (Eva 2004). In addition, the patient is mostly
4
5 a young male as it is argued that cases are often more complicated with children, elderly, and
6
7 women. Chronic disease and diffuse/general symptoms are found to complicate decision-making
8
9 and the experienced clinician may perform CDM in a more complicated manner, less explicit and
10
11 less accessible to study (Choudhry, et al. 2005; Norman, et al. 2007). A case with a doctor with
12
13 little clinical experience meeting a young male patient with an acute medical problem in the
14
15 medical ward would therefore be most likely to verify the hypothesis. Birgitte & Kim is such a
16
17 case.
18
19

20 21 22 **The case of Birgitte and Kim** 23 24 25 26

27 It is 3.10 PM a day in the beginning of March. The main office at the reception ward of
28
29 the medical department is full of people going in and out, communicating, making notes
30
31 on the central board where core data on all the admitted and expected patients are on
32
33 display. “We’ve got 17 in the rooms and 5 in the hallway” one nurse says to another. The
34
35 Head of the department of internal medicine is on the phone trying to redirect some of
36
37 the incoming patients to other hospitals.
38
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41
42 Birgitte just arrived for her evening-night shift. She is trying to find out which patient to
43
44 see first. A senior doctor, Hanne, comes along, gathers the young doctors from the main
45
46 office and directs them to a smaller room down the hall. Hanne says to me: “I’ve got to
47
48 get them out of there so we can plan this. It gets us away from the nurses’ chattering and
49
50 makes it possible to create an overview”. The doctors from the day shift then briefly
51
52 describe each patient and they agree on the plans for each for the next 12 hours.
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3 After this change-of-guard, Birgitte goes back to the main office and reads the file on the
4
5 first patient to see: Kim. He is 29 years old, previously admitted with problems relating to
6
7 drug abuse and alcohol. The admission papers suggest some kind of dermatological
8
9 disease. A nurse, Helle, has been to see Kim and informs Birgitte that: "He hasn't been
10
11 drinking, he says [frowns to indicate that she doubts this]. His legs are swollen. The pulse
12
13 is a bit high. And he is on Sobutex⁸".
14
15

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17
18 Birgitte goes to see Kim in one of the bedrooms. Kim is in his bed behind a curtain. The
19
20 light is dim in there, and it is cold. They say hello, and Birgitte asks Kim to tell his story.
21
22 It takes a while. Birgitte frequently has to ask additional questions and finds it difficult to
23
24 keep Kim on the track she is interested in:
25
26

27
28
29 B Could we return to talk about your legs?

30
31 K You are the third person to ask

32
33 B But the others were nurses. I am a doctor.

34
35 K So, you're a doctor?

36
37 B Yes

38
39 K Now I can't remember what you asked me

40
41 B Then I suggest that you pay attention – so we may help you!
42
43
44

45
46 Kim talks much about his experiences with alcohol, his attempts to stop drinking, the
47
48 hangovers and the abstinence symptoms, the ways he manages his medication. Gradually,
49
50 the story emerges that Kim's legs started to hurt and grow swollen 3 months ago; he has
51
52 had a fever for 3-5 days and has a temperature of 39 degrees Celsius today. His heart is
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⁸ A drug given for opioid abuse and indicate a significant and chronic drug abuse.
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3 pounding, but it does not feel like abstinence symptoms. He pees a lot, he cough up some
4
5 yellow-greenish sputum, he feels dizzy, he has a headache.
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9 The conversation is interrupted because Kim has to pee, then a bioanalyst comes to do
10
11 the bloodwork and several times Kim almost falls asleep in the middle of a sentence.
12

13 Birgitte finds that he is in a poor physical condition; pale, foulsmelling, black teeth. She
14
15 does a head-to-toe physical examination and finds his right elbow swollen and tender,
16
17 both lower legs are swollen and the right foot also strongly red. The legs are tender all
18
19 over.
20
21

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23
24 Birgitte leaves the bedroom and meets Hanne in the hallway. She tells her about Kim.
25

26 “Why don’t we take a look at the patient?”, Hanne suggests. They go back in, Hanne
27
28 examines Kim. They leave and talk some more. Hanne agrees that an ultrasound of the
29
30 legs should be made to check for deep venous thrombosis, but adds that the elbow
31
32 should be scanned for an abscess, which could explain the fever. She is also convinced
33
34 that he has erysipelas. Hanne calls the department of cardiology to request echo-
35
36 cardiography, but they do not find this necessary.
37
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40
41 Helle, the nurse, asks Birgitte what to do about Kim tonight. Birgitte asks her to check his
42
43 blood pressure, temperature, pulse and level of consciousness regularly. Hanne who has
44
45 been to see Kim again enters and says that “He has blood on his legs, where he has been
46
47 shooting himself with something. It’s gonna be mighty difficult to get an intravenous
48
49 access”. Birgitte gathers the information she has at this point, dictates the entry to Kim’s
50
51 file following the standard format: Reason for admittance, allergies, description of the
52
53 story, previous medical history, symptoms divided by organ systems, medication, alcohol,
54
55 tobacco, social history, physical examination – one organ or body part at the time. She
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1
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3 enters a list of possible diagnoses: Erysipelas, drug abuse, abscess of right elbow,
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5 suspicion of renal disease.
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9
10 Birgitte enters Kim's usual medication and adds B-vitamins to the list. She prescribes
11
12 intravenous antibiotics on the suspicion of pneumonia, erysipelas and abscess of the
13
14 elbow. Her plan for tests includes x-ray of the thorax and ultrasonography of legs and
15
16 elbow as suggested from her talk with Hanne.
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18
19

20
21 Birgitte moves on to see other patients. Later that evening the ultrasonography shows
22
23 Kim to have deep venous thrombosis of both legs, but no elbow abscess. The reason for
24
25 Kim's fever remained a bit uncertain. The antibiotics were changed (by other doctors)
26
27 several times over the course of the next days. He eventually discharged himself, and
28
29 doing so suspended the antibiotics as well as the anticoagulant treatment of his
30
31 thrombosis.
32
33
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35

36 **Case analysis**

37
38 How do we make sense of such a story? What are the processes of decision-making involved?

39
40 Applying the model for the initial clinical decision-making (Figure 1) in the case, the events are
41
42 the following:
43
44
45

- 46
47 1) Patient-doctor contact – Birgitte, the intern, enters the room and goes to the bed where
48
49 Kim, the patient, lies. They exchange greetings and begin the interview.
50
51
- 52
53 2) Collecting data – Birgitte asks questions of Kim and listens to his answers. She examines
54
55 him and notes what she finds.
56
57
58
59
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- 3) Applying knowledge about disease entities – Birgitte thinks about what diagnosis or diagnoses could explain the patient’s symptoms and her findings from the physical examination.
- 4) Finding a diagnosis – Birgitte enters the following diagnoses in the patient’s file: bilateral erysipelas, abuse of alcohol and medicine, abscess of the right elbow, possible kidney disease.
- 5) Applying knowledge about prognosis given different kind of treatment – Birgitte thinks about what kind of treatment might help the patient get better (in case of erysipelas), prevent negative consequences of health problem (in case of abuse) or help clarifying the diagnosis (in case of the elbow).
- 6) Choosing a treatment - Birgitte prescribes antibiotics, vitamin B, ultrasound of the elbow and examination by an orthopaedic surgeon.
- 7) Monitoring the results – Birgitte prescribes supplementary blood tests and knows that her senior colleague will examine the patient later in the evening.

So, apparently the model is relevant as a descriptive tool and helps the analysis of the process of CDM in this case. But going through the process chronologically reveals that none of the seven steps are exactly what they seem:

When **Birgitte meets Kim (step 1)**, she has read the admission paper, which gives a brief history of the patient and possible diagnoses. Before entering the room, she is already reflecting about this information and what to do about it. The nurse gives her ‘the values’ (blood pressure, pulse and temperature) and her initial overall evaluation of the patient and notes that ‘he says that he

1
2
3 hasn't been drinking', but with her facial expression she shows that she doubts what the patient is
4
5 saying. So, before the doctor meets the patient, interaction and reflection concerning steps 2
6
7 through 6 are already being made.
8
9

10
11 **The collection of data (step 2)** has thus started before Birgitte sees the patient and, anyway, she
12
13 is not just *collecting* the *data*. Rather she is trying to make sense of diffuse, poorly defined and
14
15 sometimes even contradictory pieces of information that she has to bring together into a
16
17 coherent picture that she can represent in the text she enters into the patient's journal. She must
18
19 make an effort to understand the patient, choose what to believe; interpret, combine and create
20
21 information. This process goes on long after she has left the room the first time and is
22
23 supplemented by the senior doctor's assessment and the interaction between the two doctors.
24
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28
29 **Knowledge of clinical signs and symptoms (step 3)** is applied in the construction of
30
31 information about the patient, and, based on this, different attempts of labelling the patient's
32
33 condition are made. But whose knowledge? How is it applied? By whom and when? Rather than
34
35 being a separate step, this is an integrated part of the construction of information and used in the
36
37 continuing process of trying to make sense of the patient's condition. This is done both by the
38
39 patient, the doctor admitting him, the nurse, Birgitte and Hanne. Their individual interpretations
40
41 are played out and modified during their interaction; different conclusions are reached, adjusted,
42
43 supplemented and developed.
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48
49 **Deciding upon a diagnosis (step 4)** thus becomes a collective process that goes beyond
50
51 Birgitte, both in time and space. It seems to be a kind of label for the reflections going on
52
53 between the actors and opens a number of possibilities for action. The actions, however, to some
54
55 extent determine the diagnosis, i.e. it is not just the other way around. For instance, Birgitte is not
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2
3 at all certain about the diagnosis *erysipelas*⁹ because she has never seen that in both legs at the
4
5 same time and did not think this possible. Moreover, she does not know whether the red, swollen
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7 elbow is due to an infection. But the patient has a fever and seems to be in need of treatment, so
8
9 she needs to do something. The diagnoses allow her to prescribe antibiotics. She is aware this
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11 may not be necessary, she tells me, (the swollen legs may be due to stasis rather than infection) or
12
13 may need to be modified later (as the infectious agent may not be *Streptococcus*). But it is one
14
15 possibility to treat the patient – and for acquiring more information: If temperature drops and
16
17 blood values normalize, this will indicate that the patient had an infection that responded to
18
19 antibiotics. In other words, the process of information generation is still going on. Treatment and
20
21 diagnosis are not just connected: they are inseparable in practice.
22
23
24
25
26

27 **Knowledge about prognosis (step 5)** is both present and not. At one hand, the interaction
28
29 around the patient leads towards diagnosis for which qualified guesses about prognosis can be
30
31 made. For instance, erysipelas treated with penicillin will usually recede and the patient will be
32
33 cured. However, in this case, diagnosis is uncertain, and even if it turns out to be *true*, it is
34
35 difficult to say what the likely prognosis is for this patient with several interrelated health
36
37 problems. So, the intern chooses to do what she believes is beneficial for the patient here and
38
39 now, but prognosis beyond the next few days is too insubstantial to be used as guide for action.
40
41 Instead, the doctors and nurses involved focus on a small number of issues that can be handled
42
43 as separate entities with the means at hand in the medical ward. Thus, it appears to be knowledge
44
45 about local duties, local organization and local possibilities that is applied to the patient's case
46
47 rather than knowledge about the prognosis of specific health problems. These kinds of
48
49 knowledge are not only held by the doctor or limited to a specific step in decision-making.
50
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57 ⁹ Erysipelas (from Greek: *erysi* red + *pelas* skin): An acute streptococcal infection in the subcutaneous connective
58 tissue of the skin. Originates from a lesion of the skin and often involves fever.
59
60

Deciding upon a treatment (step 6) seems to be a point in time and space where decisions are actually made. This is how this is represented in the patient's file:

rp¹⁰. subl¹¹. Subutex¹² 16 mg

rp. tabl. Risolid¹³ 25 mg x4 samt p.n.¹⁴ max. x 2

rp. B.combin stærke samt Thiamin 300 mg¹⁵.

rp. Penicillin 2 MIE i.v. x 3¹⁶

rp. Dicillin¹⁷ 1 g x 4 i.v.

rp. vanlige indlæggelsesprøver¹⁸ samt venyler¹⁹ og D-dimer²⁰

rp. rtg. af thorax²¹

rp. UL af højre albue samt begge UE²²

rp. ortopædkirurgisk tilsyn m.h.p. albue²³

rp. BT i aften og igen i morgen tidlig²⁴

¹⁰ rp. is short for Latin *recipio* receive, meaning that the patient should receive the following test or treatment.

¹¹ subl. is short for Latin *sub-* under and *lingua* tongue, meaning that the medication should be placed under the patient's tongue.

¹² Subutex is a commercial name for buprenorphin, a partial opioid-agonist used in the treatment of opioid dependency.

¹³ Risolid is a commercial name for chlordiazepoxid, a benzodiazepine used to reduce anxiety, but also to reduce the symptoms of alcohol abstinence and used in withdrawal therapy due to its long half-life in the body (several days).

¹⁴ p.n. is short for Latin *pro necessitate*, meaning that the patient should be given the medication when needed, but in this case no more than two times a day in addition to his regular treatment.

¹⁵ B. combin and Thiamin are medications with different kinds of vitamin B. Alcoholics often suffer from vitamin B insufficiency due to a diet with a large quantity of alcohol and a reduced intake of vitamin B-rich substances like cereals, lean meat, liver, kidney and eggs.

¹⁶ Penicillin is still the most widely used antibiotic for infections believed to be caused by *Streptococcus*. MIE is short for the Danish term for *billion units*. I.v. is short for Latin *intra-* into and *venosus* blood vessel, meaning that the medication should be injected or infused directly into one of the patient's peripheral veins.

¹⁷ Dicillin is the commercial name for another antibiotic, dicloxacillin, often used for infections with bacteria resistant to regular penicillin.

¹⁸ = regular admission tests

¹⁹ = blood cultures, used to determine the microbiological nature of a specific infectious agent

²⁰ = short for plasma fibrin D-dimer, a substance released in the degrading of fibrin. The level in the blood is increased in a number of conditions like deep venous thrombosis or embolic lung disease, but may also be increased by infection.

²¹ = x-ray of thorax, often called *plain x-ray*

²² = ultrasonography of the right elbow and both legs

²³ = clinical assessment of the right elbow by orthopaedic surgeon

²⁴ = blood pressure measurement tonight and again in the morning

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2
3 The long list of footnotes indicates the amount of information packed into these phrases.

4
5 However, the number of choices made by the intern is relatively small:

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7
8
9 1) Subutex and Risolid are medications Kim has been taking for some time. So no choice is made
10
11 by continuing these. The patient has already been diagnosed with a combination of different
12
13 dependence and abuse disorders. Birgitte acknowledges this by entering the information into the
14
15 journal.

16
17
18
19
20 2) B.combin and Thiamin is standard treatment to any patient with real or suspected alcohol
21
22 abuse. So, again, Birgitte is not really making a decision, but simply acknowledging the choices
23
24 made by other doctors and following an explicit procedure in the ward.

25
26
27
28
29 3) The administration of Penicillin and Dicillin is not just a treatment, but also represent a search
30
31 for healing and for a relevant diagnosis. They also represent a desire to do something. In the
32
33 eight days following Kim's admission, antibiotics are changed to Penicillin + Dicillin +
34
35 Gentamycin + Metronidazol, then changed to Metronidazol + Zinacef, then changed to
36
37 Penicillin + Dicillin + Metronidazol. He is still showing signs of infection when he discharges
38
39 himself without a plan for follow up and we cannot really say what kind of infection he had.

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43
44 4) 'Regular admission tests' is another standard; blood cultures are standard when a patient has a
45
46 temperature above 38²⁵; *D-dimer* is done if a deep venous thrombosis is suspected. All these blood
47
48 tests were ordered by the nurse on the basis of the information available, before Birgitte goes to
49
50 see the patient. This is done to reduce the time before the results of the blood analyses are ready.
51
52 So, they are not a consequence of the intern's reflections based upon meeting and examining the
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58 _____
59 ²⁵ Or rather: 'standard' in this particular department of internal medicine.
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3 patient as the model and the hypothesis implies. They are done prior to Step 1 as a result of local
4
5 organization and habits.
6
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9
10 5) X-ray of thorax is another standard when receiving a patient in the medical ward. Birgitte says
11 in the interview that the X-ray is done to search for an infection focus. This could be seen as a
12 decision based on a combination of data and knowledge. But it would be done anyway since it is
13 done with all new patients. If a search for an infection was the issue, you might expect other
14 activities as well: Checking the patient for stiffness of the neck, specifically listening for unusual
15 heart sounds, checking the patient's skin all over or doing a thorough examination of the
16 abdomen; activities that did not take place.
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27 6) Ultrasound and examination by an orthopaedic surgeon was made on the suggestion by
28 Birgitte's senior colleague when they went to see the patient together. So, again the decision is
29 not made by Birgitte but results from the interaction between different actors in the situation.
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35 **Reasons why H0 cannot be verified**

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38 The case of Birgitte & Kim presents a number of challenges to the null hypothesis. Although
39 elements of the theoretical framework are recognizable in the case – Birgitte use hypothetico-
40 deductive reasoning about the fever, Hanne use pattern recognition of erysipelas - their
41 explanatory power is limited: It is possible to *describe* different kinds of reasoning, but they only
42 *explain* a lesser part of the choices and decisions actually made. There are six reasons for this:
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51 1) H0 implies a chronology of events that could not be found in observed practice. Choices
52 about diagnosis are often made before collecting data, treatment is often chosen before the
53 diagnosis and as a way of collecting data about diagnosis.
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3 2) H0 sees context as outside 'factors' which 'influence' CDM. But context here is also the scene
4
5 itself, which help to define the decisions, suggest the spectrum of possible choices and supply the
6
7 tools and the organization to carry out the choices in practice. The example shows that the young
8
9 doctor needs to understand and work with local conditions if she is to get anywhere with the
10
11 patient. Local organization, cultural norms, implicit rules and particular persons involved in the
12
13 specific case is the clinical drama.
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15

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17
18 3) H0 represents CDM as an objective process performed by the doctor. The model implies that
19
20 *data is collected*, but actual practice is that *information is constructed*. It is the doctor's personal
21
22 experience of the patient, modified by the patient, relatives, nurses and the doctor's present state
23
24 of mind as well as the local context that must be represented in the patient's journal. This
25
26 involves choices, doubts, putting things together and weighing many kinds of information against
27
28 each other and at the same time making priorities about what to do and in what order; a highly
29
30 subjective and embedded process.
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35 4) In H0, CDM is seen as a cognitive process: Clinical reasoning and clinical decision-making are
36
37 seen as the same thing. The cognitive processes – the reasoning – are part of the process, but so
38
39 is the organization, the actors on the scene, the physical objects and the architectural lay-out of
40
41 the ward. All of these provide a decisional matrix which structure, focus and limit the decisions
42
43 to reason about and the spectrum of possible actions that may result.
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48 5) In H0, the clinical decision is seen as an individual process: The young doctor is expected to
49
50 arrive at the right diagnosis and the relevant therapy. However, cognitive processes take place for
51
52 all the actors in the scene. Since they are interacting with each other through words, gestures,
53
54 movement and manipulation of objects, it turns out that the clinical decision-making may – in
55
56 part – be a cognitive process, but not an individual one.
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5 6) H0 assumes CDM to be a process separate from other actions taking place with and around a
6
7 patient in a health care system. All kinds of processes take place that – depending on viewpoint
8
9 and preferences – may be termed logistics, learning, healing, organization, communication, social
10
11 interaction, or practice. These processes do not just interact; they are inseparable in the practice
12
13 of the case (Latour 1991; Wenger 1998).
14

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17
18 These six reasons makes it difficult to verify the theoretically grounded hypothesis (H0) that
19
20 clinical data are transformed to clinical decisions through an individual cognitive reasoning
21
22 process that may be influenced by contextual factors. The case and the discussion above suggest
23
24 an alternative hypothesis (H1):
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29 Clinical decision-making is a process in which the patient and the doctor are embedded in
30
31 a social-material matrix that helps structure, limit and focus decisions about diagnosis and
32
33 therapy. The process involves much reasoning by the actors involved, but reasoning and
34
35 decisions are integrated parts of the context in a *dynamic relational network* rather than a
36
37 process separate from and influenced by 'contextual factors'.
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41
42 This suggests a role for the doctor different from the 'trail blazer' role in the null hypothesis; a
43
44 role of continuous interaction centred on core themes and with adaptation based on how other
45
46 actors participate. The image of the 'jam session' contains these same qualities and can be used as
47
48 a practical image of the activity the doctor participates in.
49

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53 The new hypothesis opens a space for CDM-studies on social structure and relations, long argued
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55 for (Clark, et al. 1991)³³, and to heed the anthropologists' strong case for a more context-sensitive
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3 theoretical framework for the analysis of CDM (Gabbay and May 2004; Garro 1998a; Garro
4
5 1998b; Mattingly 1998).
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9 10 **Construction of relations**

11 Mol showed in her analysis of the treatment of lower limbs arterial disease (Mol 2002) how
12 different ways of conceptualizing the clinical problem in the interaction between patient and
13 doctor within a specific clinical context produced different kinds of information and different
14 ways of talking about and treating the disease. The relations – interpersonal, situational,
15
16 organizational – determined what to talk about, how to talk about it, what was considered
17 information and what possible actions to take. Thus, *relations* became basic to – by limiting,
18 focusing and producing – what kind of *decisions* to make, what kind of *information* was relevant and
19 what kind of *action* to perform. Relations were not just a starting point. They were the continuing
20 framework for interpretation and re-interpretation.
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33 This resonates with Birgitte's experience in internship and the *construction of relations* in daily
34 practice. She learns to take part in a number of routines concerning admission of a patient to the
35 ward: The division of labour in the ward, communicating with the nurse about a new patient,
36 taking the patient's story, doing the physical examination, requesting the blood analyses,
37 requesting diagnostic imaging, dictation of the patient's file, entering prescriptions of medication
38 in the electronic file. These routines are performed within a given clinical setting – the medical
39 visitation ward of a particular medical department in a particular hospital.
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51 Birgitte acts in relation to the other actors in the field. These relations are continuously
52 renegotiated based on the actors' experience and expectations and based on the specific situation.
53
54 Birgitte's interaction with others influence, frame and limit what may take place with Kim, but it
55 also provides guidance and direction to activity. Birgitte is provided with information about Kim
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1
2
3 before she sees him, and she is given clues about what to expect from this and from the usual
4
5 spectrum of conditions seen at the medical department. She has certain options for seeking new
6
7 information – prescribing certain tests, conferring with her colleagues. Her interaction with Kim
8
9 is difficult, and this difficulty and her ways of dealing with it also influence how diagnosis and
10
11 treatment is pursued.
12

13 14 15 16 **The construction of decisions**

17
18 Studying how information is constructed from a brain scan, Roepstorff described how ‘knowing
19
20 becomes a pre-requisite for seeing’: Expectations about what to expect from the scan - and clues
21
22 from the scan and the situation that these expectations were relevant - made it possible to
23
24 interpret the images in a meaningful way. Roepstorff compared this to the process of learning to
25
26 navigate a small dinghy between mountains of ice in a fiord in Greenland. Knowledge of
27
28 navigation in this particular setting also became a guide for seeing, and as a result hereof for
29
30 safely navigating the fiord (Roepstorff 2007).
31
32

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36 In the medical ward, this means that there are certain patterns looked for – erysipelas, thrombosis
37
38 etc. – because they allow decision-making to happen. The rooms, objects, persons and
39
40 organization of tasks in the ward are *context markers* (Bateson 1972) that give Birgitte indications
41
42 of what Kim’s problem is and what her task is in relation to his problem in this context; a
43
44 *construction of decisions* that happens before a decision can be made : Birgitte is working in the
45
46 context of a medical ward, and therefore she – and everyone else working in that setting – expect
47
48 patients to be sick, probably acutely sick and sometimes even in need of immediate or intensive
49
50 care. They may have chronic diseases as well, but given admission to the hospital, you would
51
52 expect them to have a sudden worsening of symptoms or clinical signs. Otherwise, they would be
53
54 in their home or receive treatment from their family physician. Patients are expected to be willing
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3 to receive treatment, and the doctor is given the privilege of asking the patient questions and
4
5 doing tests with the aim of finding the best treatment.
6
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8
9 So, Birgitte knows much about what is going to happen, when she goes to see Kim. She knows
10 this as a consequence of him being in the ward and of her being in the ward: She is going to
11 obtain information and represent it in the journal, and she needs to move towards a diagnosis
12 and a treatment; to decide if the patient is in need of immediate treatment and which kind of
13 treatment. If there is any part of these decisions that she feels unable to manage, she must decide
14 how to relay this decision to someone else. She is not, for instance, supposed to make decisions
15 on what kind of impact the patient's condition has for his work-life or social life. She is not
16 supposed to make decisions about the long-term therapy for his addiction. She is supposed to
17 make an assessment of the specific here-and-now acute health problems and get the patient
18 started on a trajectory towards dealing with exactly those problems. The construction of
19 decisions limits, frames, focuses and gives direction to these activities.
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35 **The construction of information**

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37 Ludwik Fleck's *Genesis and development of a scientific fact* described how the disease-category syphilis
38 and the diagnostics involved in the disease were constructed in a historical process, showing how
39 an apparently natural category of a diagnosis is, in fact, a social construction²⁶. Medical decision-
40 making is a fact-and-act-producing activity (Fleck 1979). Birgitte & Kim is a micro-image of this
41 *construction of information*.
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51 A central task that Birgitte has with Kim and with any new patient is to obtain the relevant
52 information concerning the patient's illness. It is part of the construction of decisions that this
53
54

55 ²⁶ The idea of syphilis as a constructed category may be difficult for some doctors accustomed, as I am, to disease
56 categories as 'natural'. But the disease is not just bacteria. It is human behaviour, vulnerability, social norms,
57 symptom management, lab procedures, clinical assessment and choices about therapy and disease control. All of this
58 'is' the disease, and all of this is constructed.
59
60

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3 should take place, and a task that Birgitte has been trained to perform in medical school. The aim
4
5 is to understand the patient's situation, bodily sensations and the chronological development of
6
7 the illness to provide foundation and starting point for classifying (diagnose) and treating the
8
9 patient. A basic supposition for Birgitte and other interns is that this information already exists as
10
11 facts when they see the patient, but that they need to find a way to access them. But the clinical
12
13 facts, they find, may be difficult to obtain for the doctor: The patient (the doctors learn) may be
14
15 too ill, too weak, or too forgetful to provide the right answers to the doctor's questions.
16
17

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19
20 The language concerning this activity underlines the presumed solidity of information or data:
21
22 The doctor 'takes' the story and does an 'objective' examination. Interns do not think of this as a
23
24 creative process but as an uncovering of fact. The creative and subjective dimensions are,
25
26 however, very obvious in actual practice. The patient does have direct experiences of his
27
28 condition, but transforming this into specific terms, events, sensations and thoughts that may be
29
30 presented in a certain oral form with sequence and specific relevance is not a given. It is a
31
32 sensory, perceptual, cognitive, communicative and socio-cultural operation that needs practice.
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37

38 **The construction of action**

39
40 The purpose of the construction of relations, decisions and information is to manage the
41
42 patient's problems and aim at generating the best outcome for this particular patient. In and from
43
44 these constructions, a *construction of action* emerges: The doctor needs to be involved, act and
45
46 interact to produce results and additional actions: Birgitte actively asks questions to the patient to
47
48 elicit responses, she communicates with the nurse to get certain tests done and makes
49
50 arrangements for giving intravenous fluid and medication; she asks Hanne for advice to make the
51
52 diagnostic process proceed; she fills out the x-ray request form. All of these actions are related to,
53
54 but not determined by, the patient's condition. The elbow is a part of the body not usually given
55
56 much attention at a medical department, and the senior physician refers the handling of the
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1
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3 elbow to the department of orthopaedic surgery. Thus, organizational structure influences but
4
5 does not determine action.
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9
10 Roepstorff may focus more on the social-cognitive aspects of the process and Mol more on the
11
12 social-contextual aspects, but the basic process is essentially the same in the case of the
13
14 Wasserman-reaction of syphilis, the interpretation of the brain scan, the treatment of lower limbs
15
16 arterial disease and Birgitte & Kim: Each of the four constructions create the context and the
17
18 direction for the other three, creating a seam-free process of social interaction, only vaguely
19
20 represented in decisions listed in the patient's journal. This is portrayed in figure 2. Each circle in
21
22 the model represents a process that give direction to the following circle: The *relations* in the ward
23
24 suggest certain *decisions*, which in turn make certain kinds of *information* more relevant, suggesting
25
26 what kind of *action* to take; action that may lead to changes in whom Birgitte interacts with and
27
28 how.
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32

33 *Figure 2. The constructions of clinical decision-making*

34
35 *(insert Fig2 here)*
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38

39 **Conclusion - Trail blazing or jam session?**

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41
42 Previous research indicate the need for a new conceptualization of clinical decision-making; a
43
44 need for a new theory through which *to see* actual clinical practice. We doctors may tend to think
45
46 of ourselves as trail-blazers: clearing pathways for dealing with each patient's problem and putting
47
48 up markers for others to follow. This perception is in alignment with figure 1 and H0. If Birgitte
49
50 & Kim is indeed a critical case and if the reasoning of this article is valid, we have to conclude
51
52 that H0, *the trail blazing*, is difficult to verify and that we may need a different model of what we
53
54 do.
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3 *The jam session hypothesis*, the four constructions and figure 2 suggest a starting point. When clinical
4
5 decision-making is described as a process of on-going, interrelated constructions in a socio-
6
7 material space we may better understand the involved actors and the outcome of the processes.
8
9 This is a representation of practice consistent with research describing cognitive processes of
10
11 doctors, but extends the understanding of decision-making from the individual cognitive domain
12
13 to the collective social domain in a specific organizational and physical setting.
14
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16
17
18 Context is clearly important in decision-making. But there are two different understandings of
19
20 context to choose from here, and the choice we make has significant impact on the research we
21
22 do. Durning et al. describe clinical reasoning at the centre, influenced by outside contextual
23
24 factors (Durning, et al. 2011). This relates to trail blazing, where the trail and the goal is central,
25
26 but may be hindered by outside conditions that limit speed or impact direction. Bateson's
27
28 concept of context markers (Bateson 1972) is grounded in a very different understanding of
29
30 context: Birgitte picks up clues that help her, give her ideas and to which she reacts. Context, in
31
32 this sense, is not outside factors getting in the way of reasoning; it is the coherence that allows
33
34 meaning to emerge. This is the context-understanding underpinning the jam session hypothesis
35
36 and the four constructions.
37
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39
40
41 We cannot say from this study how interns – or doctors in general – conceptualize CDM
42
43 themselves. We can assume that if asked, they will answer in line with official textbooks. But we
44
45 can reflect why models and theories that show no good match for the challenges of daily clinical
46
47 practice have not been questioned and challenged more: Why are doctors taught a CDM concept
48
49 out of alignment with clinical practice? The fieldwork actually gave indications of an answer: The
50
51 trail-blazing perspective has two important roles in the clinic: 1) It gives the doctor a defined
52
53 sense of professional self; a haven from the tension of being betwixt and between: this is who I
54
55 am and what I should do. And 2) It gives other actors a framework for effective interaction with
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3 the doctor. This becomes clear when it breaks down – like when Kim thinks Birgitte is the nurse.
4
5 But in a clinical reality getting more complex, more dynamic, and more political, this trusted
6
7 guide aligns poorly with a reality less inclined to fit a linear model. What should we develop in its
8
9 place?
10

11 12 13 **Acknowledgments**

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26
27 and Sickness.
28
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32

33 **Ethics Statement**

34
35 The interns were given written information about the project and gave oral consent to
36
37 participate. The head of each clinical department was given written information and gave written
38
39 consent to allow participant observation at the department. The regional ethics committee was
40
41 consulted and decided that no formal ethical approval was needed due to the purpose of research
42
43 and type of empirical data collected. As a medical doctor, I was obliged by patient-doctor
44
45 confidentiality and standards of clinical conduct when interacting with patients and their
46
47 relatives.
48
49
50

51 **Disclosure statement**

52
53 No potential conflict of interest was reported by the author.
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