Health in Disasters
A Science and Technology Studies Practicum for Medical Students and Healthcare Professionals
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ACKNOWLEDGEMENT

This STS handbook has been produced as the result of several technical meetings at IAEA in Vienna, Austria, that gathered international experts and Japanese medical doctors who have been involved at the frontline of the Fukushima nuclear power plant accident to respond to medical emergencies. Through a series of intense discussions with these concerned Japanese physicians and scientists, and in consultation with a panel of experts in social sciences, the participants of the meeting reached the conclusion that only a multidisciplinary STS approach could help in addressing a complex situation such as the Fukushima Daiichi accident.

The preparation of this STS handbook is in line with the educational needs of Fukushima Medical University and other Japanese institutions and has been possible through the contributions and expertise of many experts, especially Japanese medical doctors from Fukushima Medical University, Hiroshima University, Nagasaki University and National Institute of Radiological Sciences (NIRS). Special thanks go to Dr Shunichi Yamashita, Dr Tetsuji Okamoto, Dr Kenji Kamiya, Dr Akira Ohtsuru, Dr Koichi Tanigawa, Dr Arifumi Hasegawa, Dr Atsushi Kumagai, Dr Hirooki Yabe, Dr Kenneth Nollet, Dr Noboru Takamura, Dr Tomoyoshi Oikawa, Dr Makato Akashi, Dr Hideo Tatsuzaki, Professor Hideyuki Matsui and Dr Jun Shigemura. We would also like to thank Dr May Abdel-Wahab and Dr Ahmed Megzifene for their inputs and editing of this handbook.
PREFACE

Historically, the main concern of medical professionals was the symptom. The patient was a carrier of symptoms to which observation, medical reasoning, and techniques were applied. Therefore, the medical concern did not extend much farther than the biological body. Even when operating in a public health capacity, it was not seen as the responsibility of medical professionals to understand socio-cultural factors, even when they had an obvious influence on outcomes.

The Fukushima nuclear power plant accident of March 11, 2011 has challenged these assumptions.

Through technical support by the International Atomic Energy Agency (IAEA), a number of meetings between international and Japanese experts were organized by the Department of Nuclear Sciences and Applications, the Division of Human Health (NAHU) with the collaboration of the Fukushima Medical University in 2013-2014. The international experts were impressed and moved by the attempts of Japanese health professionals to mitigate the damage caused by the compound disaster – the earthquake, tsunami, and nuclear power plant accident. However, many responders would be the first to admit that they were greatly disadvantaged by their limited training in the social dimensions of disaster. Thus, items not covered in the education and training of these professionals impinged on the efficacy of the Japanese medical response to the Fukushima Daiichi accident, and by extension, on the general health of the Japanese population.

There is a persistent need for medical professionals, educators, and aspiring medical students to acquire a broader understanding of the tightly bound relationship between patient and society. This requirement becomes only greater when facing disaster, as knowledge of the social is increasingly important in establishing and maintaining a relationship between professionals and citizens during catastrophic events.

This handbook has emerged from this need to better understand the social dimensions of disaster. International and Japanese experts in Science and Technology Studies (STS) and medical education gathered in a meeting in October 2013 to discuss the most relevant needs of the medical curriculum as expressed by faculty members of Fukushima Medical University, Hiroshima University, Nagasaki University and the National Institute of Radiological Sciences. The expert knowledge presented within the following pages urges
professionals and students alike to assume responsibility beyond that of the traditional care of patients, and to acknowledge the complexities of culture which persist beyond the examination room.

Of course, writing is a form of understanding. This handbook attempts to create and cultivate a relationship between the reader and the academics represented within their field of expertise. These chapters seek to illustrate the many areas of importance associated with disaster often neglected in the education of medical professionals. Each chapter will include important case studies to aid the medical students and health professionals in exploring and applying relevant STS concepts throughout the handbook.

We begin with an overview of general radiation history and the historical shaping of cultural experience surrounding disasters in the Japanese context. Following this we address the crisis in expertise often inherent to the onset of disasters and the nature of contested diseases, especially with regard to psychosomatic afflictions. Next, the topics of coping with disasters, risk communication, and social determinants of health address the issues of risk perception and communication within society, and between medical professionals and their patients. Finally, we discuss the interrelated topics of professionalism, law and ethics with regard to conceptions of value-based practice, and conclude with a general discourse upon disaster studies as a topic of analysis.

Although the primary context of this handbook is the Japanese experience, all medical professionals, students, and educators working within the medical sector would benefit greatly from the breadth and acuity of expertise presented within these pages. Disaster is a contextual matter, but its effects are universal, and arming medical professionals with the knowledge presented herein will provide strong aid to communities plighted by disaster.

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Introduction
The compound disaster in Fukushima alerted the medical community to the need for all healthcare practitioners and educators to engage with the complexities and dynamics of patients as integral to society. The need for awareness and understanding of the social aspects of health, disease and healthcare, in disaster, has been exposed. This handbook is one response to this acknowledged need and is prepared for medical students and all healthcare practitioners. Each of the chapters of the handbook draws on the valuable lessons learnt from the Fukushima Daiichi nuclear accident and incorporates applied case studies of this and other disasters. However the goal of the handbook is to provide a platform to stimulate discussion and further reading that goes beyond the particular disasters referred to, in order that the learning can be contextualized and applicable to all in any situation where there is planning and preparation for possible disasters.

The aim of this chapter is to present an introduction to applied educational theory in order to promote learner and educator engagement with the content in the handbook in a way that encourages deep learning. Through optimum use of this handbook it is expected that there will be enhancement of the understanding of the social dimensions of disasters within a range of different thought collectives or cultural environments that inform the interpretation of and response to disasters.

1. Applied Educational Theory

1.1 Pedagogy
The assumption is that adult learning is different from learning in childhood because maturity brings with it the resources of life experience together with an approach that is more inclined towards the solving of problems than the learning of subject content. The word, andragogy, is frequently used for the learning strategies that are specifically focused on adult learners (Davenport and Davenport 1985). In order to avoid the confusion and debate that at times accompanies the use of andragogy, the generic term, pedagogy, will be used in this handbook for the theories and approaches to teaching and learning.
1.2 Taxonomy of Learning

Pedagogical research has entrenched the recognition of learning as a process that takes place at an increasing level of complexity. Learning in its simplest form is the recall of facts while higher level learning involves more complex processes such as analysis and evaluation. Bloom (1956) developed a taxonomy to describe this order of learning and his classification of the levels of thinking during the learning process remain widely accepted. Bloom’s taxonomy was based on the premise that you first need to understand something before you can evaluate it or apply the knowledge in another context. This implies that prerequisite knowledge and competencies need to be in place before there can be learning at the higher level (Table 1). Anderson and Krathwohl (2001) revised the taxonomy to represent the current approaches to teaching and learning (Table 1) but retained the concept of learning according to the level of complexity.

### Table 1: Bloom’s taxonomy revised

<table>
<thead>
<tr>
<th>Bloom’s taxonomy (1956)</th>
<th>Anderson and Krathwohl (2001)</th>
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<tbody>
<tr>
<td>Evaluation</td>
<td>Creating</td>
</tr>
<tr>
<td>Synthesis</td>
<td>Evaluating</td>
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<tr>
<td>Analysis</td>
<td>Analyzing</td>
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<tr>
<td>Application</td>
<td>Applying</td>
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<tr>
<td>Comprehension</td>
<td>Understanding</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Remembering</td>
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</tbody>
</table>

In Bloom’s taxonomy, “knowledge” is the ability to recall or remember facts, and “comprehension” is the ability to understand and interpret the information. Based on Bloom’s taxonomy, health care professionals or students, in environments where a nuclear disaster is a possibility, should be able to display knowledge and comprehension of the topics related to the disaster/s under discussion. So for example, the professionals should have relevant knowledge of the natural sciences (e.g. radiation physics, radiobiology) and the applied social sciences (e.g. social health, stigmatization). The topics covered in this handbook are the key components that underpin development of health care professionals to function effectively and efficiently in a disaster.

The revised model (Anderson and Krathwohl 2001) lays out the components of learning as cognitive processes that can be applied to lesson design. These verbs have the potential to enable teaching, learning and the assessment of learning.
1.3 Learning Outcomes

The educator or study leader can incorporate the content of this handbook into the design of a lesson covering the topic of any particular chapter or a combination of chapters. It is a good idea to start by specifying the learning outcomes for a particular lesson or series of teaching, and learning activities as the main aim of professional education is to promote the achievement of high level learning outcomes in the learners (Trigwell and Prosser 1991). Learning outcomes shift the emphasis from teaching as an input process to a focus on the learner and their learning (Allan 1996). They are statements of what the learner will know and be able to do following

Table 2: Classification of learning (Anderson & Krathwohl, 2001)

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Remembering</td>
<td>retrieving information from long-term memory</td>
</tr>
<tr>
<td>Understanding</td>
<td>constructing meaning from instructional messages including oral, written and graphic communication</td>
</tr>
<tr>
<td>Applying</td>
<td>use of knowledge to carry out a procedure in a new situation</td>
</tr>
<tr>
<td>Analysing</td>
<td>deconstructing the information into its constituent parts and determining how the parts relate to one another and to the overall structure or purpose</td>
</tr>
<tr>
<td>Evaluating</td>
<td>making judgements based on criteria and accepted standards or protocols</td>
</tr>
<tr>
<td>Creating</td>
<td>putting elements together to form a coherent whole or reorganising elements into new patterns of structure</td>
</tr>
</tbody>
</table>

participation in the lesson. Bloom (1956) identified three domains of learning; cognitive, affective and psychomotor. These domains each have a level of complexity of learning that can be achieved through participation in an educational activity. According to Bloom the use of the correct verb is the key to the successful writing of learning outcomes and the revised model of Anderson and Krathwohl (2001) provides helpful verbs for this purpose (Table 2). An example therefore might be that following this lesson the learner will; 1) demonstrate understanding of the historical shaping of the cultural experiences of the disaster in Japan and 2) be able to apply this knowledge to their local context in order to plan appropriately for possible disasters of that region.

1.4 Competencies in Professional Education

In the education of a healthcare professional it is helpful to determine the competencies that the learner should achieve through the course being offered. The competencies that need to be identified include the core competencies, that are specific to the course and profession, and the generic competencies that cut across occupational and academic contexts. Mielke and Weber (1989) identified seven generic competencies; working cooperatively, learning effectively, communicating clearly,
working productively, acting responsibly, valuing self and thinking critically and creatively. These are useful competencies to keep in mind when designing a course on disaster planning and management and although they are not generally taught in lessons the learning activities should be planned to develop these generic competencies. So, for example, communication skills are essential for all professionals working in a disaster environment and the curriculum activities should enable the learners to develop the competencies with regard to the types of communication that are relevant and possibly specific to the context e.g. the communication of risk or the communication needed for advocacy and shaping changed attitudes following a disaster. The core competencies are identifiable abilities that must be achieved for the particular professional (e.g. doctors, nurses, x-ray technologists) being educated. When designing the course or particular lesson they can be described in terms of learning outcomes thus defining the appropriate content and professional practice related to disaster-medicine.

The educational shift from a focus based on theoretical knowledge and skills to competency based education provides for a learning environment that prepares the learner for the integration of knowledge, abilities and attitudes. An example of competencies identified for medical doctors are those described by the CanMEDS system as the seven roles of a physician that were developed by the Royal College of Physicians and Surgeons of Canada in order to implement postgraduate specialist programs that appropriately respond to needs of society (Sherbino and Frank 2011). In the context of education for a disaster, a competency and outcome focus will enable the professional to practice adequately and adjust to the abnormal situation effectively.

1.5 Active Learning

The lesson design should include tasks and activities that allow the learner to be an active participant rather than a passive recipient of information. It has been shown that learners retain information better and develop problem solving, critical thinking, attitudinal change or motivation for further learning through active learning, such as discussion, rather than from passive input lecture methods (Bonwell 1991). A lesson design with a balance of formal lectures and appropriate activities and tasks that promote active learning, will facilitate learning of the specified learning outcomes.

2. Designing a curriculum for learning

A professor in the Department of Physics at the Imperial College of Science, Technology and Medicine in London, stressed that teaching and learning in professional education should draw on the academic disciplines that form the knowledge base of the profession, and on the workplace for which the learners are being prepared (Barnett 2006). In this case the medical students or health care
professionals are being educated for the specific work environment of disaster-medicine; however the principles of general professional education remain relevant. The educators should use the chapters of the handbook, with content based on both disciplinary knowledge (theory) and knowledge for professional practice (situated or applied knowledge and competencies or professional abilities), to guide the selection of what to teach and how to plan activities that enable learning. The learners will benefit from engaging with the disciplines, having facilitators who are experienced educators and experts in the field of disaster-medicine and where possible having direct exposure to the real world of professional practice in a disaster situation. The latter can be through videos, interviews, the internet or other media that brings the realities of a disaster into the learning environment.

Work-integrated learning (WIL) is an educational approach that seeks to actively build connections between the world of teaching and learning, and the workplace or environment of professional practice (CHE 2011). Figure 2 shows how the three knowledge dimensions of the curriculum can be aligned; the dotted line in figure 2 implies that the separation between the disciplinary or academic and professional components is not rigid but rather the relevant elements of professional practice can be drawn on when designing a curriculum for a specific purpose. The focus of WIL is professionally-oriented education, as shown by the grey areas and is therefore a suitable basis for the design of a curriculum directly linked to professional practice within the context of a disaster.
3. Concluding comments

This handbook provides material to guide educators in healthcare programs to enhance the relationship between the student/professional and the experts speaking through the chapters they have written. An awareness of relevant applied educational theory will allow for the planning of appropriate teaching and learning activities to enhance high level learning and the achievement of competencies. The content of these chapters is concise information on key social dimensions of disaster-medicine that can be incorporated into existing programs or be used to prepare new programs. Educators and students are encouraged to use this handbook as a tool to stimulate discussion and reading that will go beyond the content of the chapters in order that the learning is relevant to the particular environment of the students and potential disaster.

Figure 2: A knowledge system for a curriculum for professional development in disaster-medicine (Adapted from CHE 2011)
References


INTRODUCTION

Gregory Clancey\textsuperscript{2} and Rethy Chhem\textsuperscript{3,4}

Large-scale disasters tend to re-structure groups of people, objects, and institutions, so that the world after the event is never quite the same as the one before. The compound disaster of March, 2011 in Japan followed this pattern. An earthquake triggered a tsunami, which in turn triggered a nuclear power plant accident. While the tsunami was by far the most serious disaster in terms of lives lost and property destroyed, the nuclear power plant accident led to a crisis of communication and public trust which exacerbated recovery from both. The breakdown in trust led to political, social, and psychological problems, some with medical consequences. Any one of these events would have been serious, but taken together and in their multiple severities, they shook the nation and the world beyond. Fundamental changes have followed in their wake, and are ongoing as we write.

This handbook is a product of one such change. The Japanese medical community was a front-line responder to the tsunami and nuclear accident, and its role in providing after-care in the stricken areas has not lessened with time. Even in a country as well-prepared for disaster as Japan, however, and one with a uniquely tragic experience with nuclear radiation, health professionals were strained by the scale and complexity of the 2011 events and their aftermath. In 2012-13, doctors associated with Fukushima Medical University (FMU) began a series of meetings with social scientists (mainly STS\textsuperscript{5} scholars), through the initiative of the International Atomic Energy Agency (IAEA), in order to both report and work through some of the difficulties they were facing. They hoped that their experiences might be made available to other health professionals in Japan and around the world, in order to prepare them for similar situations. Hence the current handbook, which is likely the first collaboration ever attempted between doctors, social scientists, and humanities scholars on the issue of radiation-related disaster.

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\textsuperscript{5} STS stands for “Science, Technology, and Society” or in some constructions “Science and Technology Studies”, which is a well-developed interdisciplinary field of inquiry dating from the 1970s.
No two disasters or accidents are exactly the same, so this handbook is not a ‘how-to’ manual or template for managing a crisis. One of many lessons learned from Fukushima is that flexibility, creativity, and the ability to cope with limited or conflicting information are essential qualities to have when protocols break down. Doctors and nurses are already highly experienced at dealing with emergencies by virtue of their regular training, so there is little we could write here to supplement or expand on this inherent medical skill-set or instinct. Our focus is rather on a state of crisis outside the highly controlled space of the hospital emergency room, a place for which medical curricula usually offer little preparation.

Large-scale disasters produce landscapes of chaos, which societies usually attempt to set right through acts and ceremonies of ‘recovery’, presaging a return to normality. The ‘return to normal’ is problematic even with relatively cyclical natural events, but when radiation leakage or fallout is added as an element, the task of recovery becomes much harder, much more prolonged, and perhaps impossible in highly-contaminated areas. The invisibility of radiation, its longevity in the environment, its complex and controversial (i.e. not entirely understood) effects on the human body, the often obscure technical language which experts use to discuss it, its historical legacy (particularly in Japan), and the politics surrounding nuclear energy all contribute to a very different doctor-patient relationship following a radiation-related accident than in the aftermath of a typhoon, earthquake, tsunami, or even other classes of industrial accident. In attempting to discuss health effects of radiation, doctors may find themselves on very uneasy ground, either having to admit to inadequate knowledge or even being accused of conspiring with those who may have been responsible for the accident in order to downplay its impact. These problems are often classed by physicians and others under “health communication” or “science communication”, but such terms are inadequate to describe the post-disaster situation in which what previously seemed like ‘solid’ knowledge is itself compromised or tested.

The doctor-patient relationship relies on trust. After the Fukushima nuclear accident, however, suspicion of authority replaced trust among many victims and their families, not to mention the general public. Skepticism was entirely natural, as an earthquake of such magnitude, and tsunami of such height, had not been predicted by government seismologists. Official hazard maps had also not pinpointed the likely location of the event. Neither had a nuclear accident of that type and scale been anticipated or prepared for by the plant’s designers, owners, or regulators. Ambiguities surrounding the geography of the subsequent evacuation zone, combined with conflicting information from experts and government
officials following the event, added further confusion and mistrust. In an atmosphere in which expertise itself, both scientific and bureaucratic, seems to break down, medical expertise is not immune. Physicians’ attempts to explain the effects of radiation to the public, and to individual patients and their families, were thus met with far more confusion, skepticism, and resistance than prevails in a normal diagnostic process. Trust needed to be restored for communication to re-open and be productive, a process that is even now continuing in Japan.

While the fear, trauma, and even the ‘existential crisis’ which settles over society following a radiation-related disaster may be beyond the control of individual physicians and nurses, disaster and post-disaster scenarios can be anticipated and prepared for. The situation as described in the paragraph above is not unique, but close to typical following large-scale disasters the world over. The field of Disaster Studies provides many lessons as to what happens to societies and individuals when previously reliable structures and frames suddenly collapse. These effects are too wide-ranging and complex to be fully explained with medical descriptors, such as “Post-traumatic Stress Disorder” (PTSD), as useful as these might be in discussing individual responses. A proper understanding requires going beyond even the psychological dimension, as important as that is, to the social, cultural, historical and even philosophical – what might be called a ‘humanities perspective’; one that takes lessons from a full range of disciplines and combines them to form a broader, fuller, and more textured image of disaster and post-disaster scenarios. This is one challenge of the present book.

Besides Disaster Studies, the interdisciplinary field of Science, Technology, and Society (STS), also known as Science and Technology Studies, has many lessons to teach about expertise under stress or crisis. Publics often under-estimate the amount of uncertainty, debate, and simply differing contexts or frames that exist amongst communities of scientists, engineers, doctors, and related technical experts. Citizens and government officials often look for and indeed expect a unified and authoritative “scientific voice” even when none exists. The press may be more conditioned to accept, indeed actively seek out, disagreement and uncertainty, but in so doing may pathologize or sensationalize what are actually normative disputes. While consensus is certainly a goal of scientific and medical debate, and closure is regularly achieved around crucial issues, large-scale disasters and accidents tend to re-open questions, or foster new ones, in the most awkward, sudden and hence dramatic ways. Moreover, they increase the numbers of ‘relevant social groups’ or stakeholders, and multiply the numbers of voices engaging questions that a day or two before were the province of a
small number of experts, technicians, or regulators. The rise of social media makes the possible number of such voices nearly infinite. Add to this the element of liability, the assortment of blame, and the very real damage to bodies and societies, and the result is much material for social scientists to weigh and ponder. Indeed, disasters and accidents can upset even social scientific consensus, which is more usually constructed around ideas of how societies behave under ‘normal’ circumstances.

What all of this means is that the present handbook is a spur to discussion and thought rather than a guide as to how one should behave, or what one should do. It is not an emergency manual, but a book to prepare students for the eventuality of emergency by opening their minds to probabilities, uncertainty, and possibilities they may not have considered in ‘normal times’. It is also, we hope, a spur to greater curiosity; a sign-post pointing toward a large, rich, and growing literature on disasters and accidents spanning more fields, and visiting more examples, than we could include between its covers.

While the contributors to this handbook come from many countries, and offer examples and perspectives from around the world, they are also acutely aware that Japan’s relationship with the disastrous effects of radiation is singular in world history. The string of events from the atomic bombings of Hiroshima and Nagasaki, to the Lucky Dragon 5 Incident, to the Fukushima nuclear power plant accident itself, cannot be adequately chronicled and analyzed in a book of this nature, and readers are strongly encouraged to engage the larger literature which explains, debates, and draws connections within this history. Likewise, the string of global nuclear power plant accidents which include Three Mile Island, Chernobyl, and now Fukushima Daiichi provide another context very relevant to the current project, and one with its own extensive literature. Many of the contributors to this volume have had direct or indirect experience with these cases, as well as other disasters and industrial accidents not having to do with radiation. This is the larger context which frames the handbook.

We should also remind readers that Fukushima Daiichi, like Chernobyl, is an ongoing crisis. The victims and potential victims still require care, and, at least around Fukushima and Chernobyl, contamination will continue to affect the natural environment and society’s relationship to it for a long time to come. Medical professionals should thus approach the topic of radiation exposure not only from the standpoint of an emergency, bounded in time. It is a situation needing to be actively managed over a long period, not only for those exposed, but their families and communities. Evacuated populations, who may not have been exposed
to any radiation at all, or to very small amounts, also require understanding, engagement, and care. While each crisis or event has ‘phases’, one should also not think of these too rigidly or concretely, as different populations and individuals can experience the same phase at different times, or skip over some of them altogether. This is another reason why a critical rather than a programmatic approach to disaster is crucial, one that constantly questions the tools and methods one is using rather than accepting them blindly or considering them unproblematic tools in a box.

Lastly, let us never forget that anyone exposed to high levels of radiation is a victim of human and societal error (or in the case of bombing). That means that those who become victims through no fault of their own could carry legitimate feelings of anger toward societies, governments, industries, and policies, which they might also legitimately seek to change. Controversies surrounding nuclear energy, nuclear weapons, and even the use of radiation in medical procedures do not have to be resolved by every health professional, but every one of us should be aware of them as a context in which encounters with patients take place. Fear of radiation and anger about exposure are not pathologies, and should thus not be medicalized, even as psychological disorders. Understanding when to apply medical terminology on the one hand, and social and philosophical language on the other, is indeed one of the skills medical students should cultivate as they grapple with the issues in this handbook. This raises larger questions about the limits of science, the risks of technology, the role of citizens, and ethics, which extend beyond the scope of the present book but are fundamental to a fuller understanding of ‘radiation and society’ as a compelling modern theme.
CHAPTER 1

TECHNO-NATURAL DISASTER AND THE ROLE OF EXPERTISE

Ulrike Felt⁶ and Rethy Chhem⁷,⁸

Summary

In contemporary industrialized societies, scientific and technological expertise has come to play an increasingly central role ranging from policy decisions to questions of personal choice. This is particularly true in extreme situations such as techno-natural disasters. Yet, at the same time, it is in these situations that people feel unsure about which expertise to trust, and medical professionals express the feeling that their authority is called into question. To discuss these issues, this chapter starts by reflecting on the specificities of a techno-natural disaster and how this situation challenges health professionals in particular ways. In a second step, the question of what an expert is and what holding expertise means is addressed from different perspectives. We then shortly point out how, through the omnipresence of mass media in contemporary societies, new kinds of experts and expertise gain visibility and challenge existing authorities. Finally, the chapter reflects on the different kinds of expertise medical professionals would need to develop in order to better contribute to handling major technical or techno-natural crises.

Learning Objectives

After reading this chapter the reader will be able to:

1. Define and explain expertise
2. Locate distrust in health professionals’ expertise within a broad understanding of the challenges during situations of crisis
3. Understand the paradox of expertise in crisis situations
4. Recognize the different actors involved in the public arena in a techno-natural disaster such as Fukushima
5. Recommend how the education system for health professionals could respond to this paradox

Keywords: Expertise, techno-natural disaster, communication, trust

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Introduction

In contemporary industrialized societies, scientific and technological expertise has become a ubiquitous source of authority. Almost all policy decisions rely on expert advice. In the realm of our everyday lives, scientific and/or technological expertise has also become of greater significance such as when people have to take individual and collective choices regarding their health, the consumption of some products (such as genetically modified food), or energy privilege. To behave like a “rational citizen” is nowadays often seen as synonymous with following the advice of experts. The latter are perceived as more knowledgeable and thus better equipped to provide the support for an informed decision. Thus, we could say: Expertise and experts are omnipresent in contemporary industrialized societies.

While this unquestioned dominance of experts is true across many areas of our lives, “they tend to be talked about only when things go wrong” (Stilgoe, Irwin and Jones 2006), e.g. in the context of disasters and even more so when health issues play a central role. This is definitely the case for the Fukushima Daiichi accident (for a case study after Chernobyl, see: Wynne 1992). Sociotechnical problems in general, and techno-natural disasters in particular, are complex and fraught with uncertainties and information is generally scarce and unstable; yet decisions need to be made quickly. Thus, expertise is highly challenged. In such situations, people’s ambivalence towards the role of experts becomes visible: expertise is simultaneously longed for and distrusted as well as tested and contested by citizens.

In such extreme situations, people working in health-related professions have to face the limits of their own professional self-understanding. Their expertise is immediately called upon yet simultaneously challenged to a degree unimagined when engaging in their daily profession under ‘everyday’ circumstances. Health professionals are accustomed to being trusted, to holding unquestioned authority, to being able to provide a diagnosis or some relief, as well as to having the capacity to offer guidance for possible actions. Yet, in such exceptional situations, when a feeling of stability is of utmost importance – as is the case in disasters – they are often confronted with the limits of their expertise and have to face people expressing doubts or questioning recommendations.

We are thus confronted with a classical paradox of expertise9: While expertise is increasingly sought for and used as a source for making choices, it is simultaneously contested (Nelkin 1975; Weingart 1999). This can be due to a multitude of reasons. Not admitting the limits of expert knowledge is one. A lack of transparency in the way expertise is selected and used might be another. Thirdly, citizens ask for more of a voice and want to contribute their own expertise in making choices, be it

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9 Bijker, Bal and Hendriks (2009) speak more generally of a paradox of scientific authority.
individually or collectively. The latter is particularly true when decisions impact on the livelihood of themselves or their family or when they feel that they hold considerable experience with the issues at stake. Finally, it is often the case that the more a person becomes an expert in a specific (all too often quite narrowly defined) domain, the more s/he is likely not to perceive wider issues and changes palpable to those possessing less specialized knowledge.

In the following we will approach these questions of expertise in four steps. We will first look at the specificities of techno-natural disasters (Perrow 2007; Steinberg, Sengul and Cruz 2008) and how they challenge the way we classically analyse health related problems, and how to deal with experts and to identify solutions. We will then look at the very idea of what it means to be an expert and to hold expertise in the medical domain. In a third part, we will reflect on the multiplication of expertise in public space and on the role the media plays in this. Finally, drawing these reflections together, the chapter offers a way to rethink health related expertise.

1.1 Techno-Natural Disasters and Their Challenges for Expertise

Nations are “imagined communities”, Benedikt Anderson (1991) argued; they are imagined and held together through political and cultural activities. Science, technology and medicine are core cultural activities and therefore national identities, i.e. conceptions, meanings and ways of being Japanese, have to be understood as closely tied to these developments (see Hecht 2001). A national identity links a mythologized past with a collectively imagined future, which often “appears as the inevitable fulfillment of a historical legitimated destiny” (Ibid.). In one way or another “the nuclear” was and is an important part of Japanese national identity, be it through the memory of the dramatic experiences ending World War II or through the more techno-optimist realization of nuclear power as a peaceful source of energy. In the second half of 20th century “the nuclear” has thus become an integral part of Japanese techno-political culture (Felt, Fochler and Winkler 2010). Viewed as part of technological and societal progress, there was a widespread belief that it could be managed and contained in favour of the nation’s development. A cross-road sign at the entrance to Futaba, now a deserted town inside the 20-kilometer evacuation zone of Fukushima Daiichi power plant, brings this belief to the point: “Nuclear Power: Energy for a brilliant future”.

Any disaster, natural, technological or techno-natural, is an event causing a substantial disruption of the economic, social and cultural life of people. It causes significant physical and psychological damage and dramatically destroys our living environment. Every society has had to endure and learn from disasters in the past – mostly “natural” ones – be it floods, fires, earthquakes. Throughout its history, Japanese society has managed to accommodate major natural forces such as earthquakes or tsunamis with broader cultural, technological and economic developments (Clancey 2006). Ways of
handling and organizing response have been developed, technological and social early warning systems have been put in place, and procedures to swiftly restore public life, even under severe conditions, have been set up.

But even though nation states have embraced technological progress and learnt to respond to natural disasters, techno-natural disasters, such as the hybrid earthquake-tsunami-nuclear disaster of Fukushima, pose completely new challenges. Well-functioning articulations between the technological and the social are dramatically disrupted, and both knowledge and experience are lacking about how to reinstall order in such a new and complex situation. This might explain why actors involved in the aftermath of the disaster almost unanimously complained about the scarcity and the low quality of the information flow. Much rather than acknowledge the full complexity of the issue at stake, many seemed to hold the strong belief that “the right information” is available, and that getting it in time would thus automatically lead to the finding of appropriate solutions.

Yet, while one can express critique of the information politics of different actors, ranging from government institutions to those running the power plant, it is important to consider several aspects. In the case of techno-natural disasters (1) it is utterly difficult to put together a reliable set of data which, from hindsight seems most relevant; (2) data gathering has to happen under extreme circumstances and in a swift manner; (3) skilled persons capable of reading and interpreting this data are often not widely available; and (4) a balance has to be found between adequate information and overflow of information, as the latter can do more harm than good and create a situation of disinformation.

Techno-natural disasters have their own timing. The necessary expertise has to be assembled quickly, data interpretations have to be performed under constantly changing boundary conditions, choices have to be made about what information is to be disseminated and to which audiences, and, finally, derive from the knowledge acquired which corresponding actions need to be taken. While this is true for virtually all disasters, it takes a particular turn when human health is at stake. Collins and Pinch (2005) have addressed this in the following quote: “Medicine is a science, like other sciences, but it is also a source of succor— a source of relief or assistance in times of distress. The two faces of medicine often conflict. One dimension of that conflict is urgency: medicine as a science has to try to get things right however long it takes, but medicine as succor has to provide an answer here and now.” Indeed, in many situations of choice related to broader scientific and technological issues people can adopt a “wait and see” position and often do not feel pressured to make choices; in health-related issues this is usually not the case. Medical practitioners, but also citizens, have to take action immediately, often under conditions where information is difficult to collect and scarce; classical expertise cannot be directly applied to the new situation, and knowledge about potential consequences of any action taken or not taken is low. Here the question of expertise becomes a particularly challenging one and needs reconsideration.
1.2 Expertise, Crisis and Contestation

Let’s start by posing two seemingly straightforward questions: What is expertise? Who is an expert?

While the notions of expert and expertise seem evident, the more we reflect on them the less this is the case. There are at least two kinds of answers we propose. The first draws on the fact that in many situations we tend to connect expertise with a high degree of scientific/formal knowledge a person holds on an issue. While this is surely one way to define it, it makes us overlook that formal knowledge is only part of what we know. Indeed, we often do not sufficiently consider the importance of tacit knowledge (Polanyi 1958/1998), i.e. intuitions, personal insights or hunches which are an important part of the knowledge any expert – as any other member of a given society – holds. This draws our attention to how the experience, values, or ideals researchers hold always nourish and shape scientific knowledge. This tacit knowledge is shared, when we learn from each other through interaction; it is thus an outcome of social relations within knowledge communities but also within society at large (see also Collins 2010). As responding to situations of natural disasters is not uncommon in Japanese society, we can claim that there is an important degree of tacit knowledge available. People are often not aware of the knowledge they possess or how it can be valuable to them and others.

We want to argue alongside Fleck (1935/1979) that any knowledge – both tacit and explicit – is always related to communities of people – communities he calls “thought collectives”; the production of any knowledge is thus an essentially social process. Thought collectives share a specific way of seeing and understanding the problems at stake – which Fleck calls a “thought style” – and of developing solutions. Being educated and working as a health professional thus always means belonging to such a “thought collective” and having acquired a specific way of addressing issues at stake. The expertise acquired through belonging to such a collective could predominantly be seen as a kind of “routine expertise” (Hackett and Rhoten 2009). This means that members of any thought collective learn to solve familiar problems by using a set of tools, techniques and approaches which are shared by its members. This works perfectly well in the health system, where patients acknowledge this expertise most of the time and are embracing and accepting this kind of expert advice to make choices.

However, particularly in complex and hitherto unexperienced situations – the situation in post-Fukushima being such a case – this well-arranged way of understanding expertise is challenged. Here a second perception of expertise enters the scene. Expertise can no longer simply be a message from experts to patients or wider publics; it is no longer a set of statements uttered by experts in a routine manner. Expertise becomes “the result of collective learning and assessment” (Limoges 1993), the
collective no longer being solely fellow health professionals, but now also including affected people – be they patients or their relatives, or simply members of society. Therefore, the interaction between the different participants in such tense and controversial situations “in the end defines the status of expert knowledge and sets the limits of its efficacy” (Ibid.). This fundamentally changes the very idea of expertise outlined in the beginning of this subchapter. In this understanding, expertise is not solely the property of a person acquired through learning in a thought collective, but something that needs to be developed and re-established in every fundamentally new situation. “When this fails,” Limoges highlights, “expert knowledge as knowledge of experts is largely discounted and ignored or, even worse, it becomes dysfunctional, a part of the problem rather than a part of the solution” (Limoges 1993).

In particular, in techno-natural disasters, it is very difficult for professionals to provide the clarity and unambiguity of expertise we seem to long for. More than ever, they need to find answers to questions they have not chosen – which is a situation contrary to that in classical research. As a consequence, they are pushed to constantly transgress the limits of their competence (Nowotny 2003), e.g. as defined in purely medical terms. Thus, in these exceptional situations, statements of experts are quasi-necessarily partly contradictory and change over time; standards of expertise are blurred, posing the question of whom to trust; expertise appears as utterly fragmented, the partiality of perspectives on complex problems renders this visible. As a consequence, there is a call to open up the question of expertise to public debate and to make expertise more transparent (Jasanoff 2003). Such a critical public debate of technoscientific issues and of who counts as expert should be seen as “an expression of confidence in its potentiality” within science and technology, and “not [as] a loss of trust” (Nowotny 2003). The importance we attribute to science and technology in contemporary societies, the authority we generally grant to these fields of expertise, however, brings along the right of citizens – in democratic societies – to express their own views of what is at stake and to question expert statements.

For the health domain, the situation takes a rather specific form. While people have learned to build personal trust relations to a small number of medical practitioners when it comes to their own and to their family’s health, in situations of crisis these intimate relationships cannot be easily upheld. Doctors are not only called on to care for individuals, but they are often pushed to make statements outside the realm they usually work. They are expected to make statements pertinent to the general population and provide public counsel – all of which goes well beyond the degree of expertise of classical health professionals. Furthermore, health-related issues are very intimate ones, deeply imbued with cultural values where people thus develop their own perspectives and have their own body of experience and expertise. Therefore the issue of the limits of expertise is raised over and over again.
1.3 Multiplication of expertise and framing of the disaster in the public space

In particular in situations of public crisis surrounding technoscientific disasters, health professionals are not the only actors that play an important role when patients and their families try to make sense of their situation. We live in a media-oriented society where much of what we know about the world comes from media in various forms. Media contributes to creating collective memories about similar situations in the past, strongly shapes perceptions of what happens in the present and, through that, also projects potential futures. Media plays an essential role in framing our understanding of what the problem is, how it develops and what is at stake (Lewenstein 1995). News about health and medicine generally rank very high in media attention (Bucchi and Trench 2008) which explains their importance in situations of disaster where health related issues matter. With social media and the internet as additional information sources, we also see a multiplication of sources people can turn to towards getting informed. These latter media, however, are open to all kinds of information, and thus multiply the voices and interpretations available. Diverse members of society – as experts of everyday life – report in much detail about their perceptions of the world; they produce, collect or distribute information and put forward their own analysis of potential dangers but also of possible solutions. Thus, they play an important role in the trust relations people can develop with classical experts.

It is therefore not only important to judge whether or not health-related news are reported correctly by journalists and others who report news, but to also consider how media reports make choices when describing, quoting and portraying health professionals when they refer to scientific evidence or when they offer interpretations of scientific studies and their consequences (Malone, Boyd and Bero 2000). Through narrating the disaster story in specific ways and through selecting and showcasing evidence, journalists (and other writers) construct specific accounts of health issues at stake and propose – sometimes implicitly – potential actions to be taken. The media thus identifies issues, validates information and shapes our views on matters to be addressed. They contribute to the production of “counter-expertise” (Topçu 2008) and become important players in developing collective and individual responses to techno-natural disasters. Furthermore, they also unfold moral narratives and distribute responsibilities.

For health professionals this means that they need to grasp the presence of such public narratives as they shape the interaction with (potential) patients. They need to acknowledge the multiplicity of available expertise and consider how relevant these are in their own domain of expertise. It is thus essential to not simply discard media reports on the grounds that they do not comply with the thought style of the community of health professionals, but to analyze them as alternative forms of understanding what is at stake – even though one might not share the view.
1.4 Conclusion: Rethinking expertise – a way out of crisis?

The reflections made so far point to the fact that the techno-natural disaster of Fukushima is not necessarily a crisis of expertise – as often highlighted. Instead, health professionals need to develop different kinds of expertise in order to adequately respond in such complex situations. It is no longer sufficient to solely rely on routine expertise, in the sense of being able to perform health-related professional work by the book. Instead, health professionals need context-specific, situated forms of expertise, and to be capable of responding to complex real-life situations which often comes with a lack of validated information, non-knowledge (i.e. admitting that medicine cannot answer certain kinds of questions), uncertainty, and contingency. This would mean to consider and specifically embed the training of these necessary skills in the education of health professionals.

Rethinking expertise means devoting more attention to three kinds of expertise. The first would be **interactional expertise**, meaning that medical professionals have to engage with people and their expertise well beyond their peer group. This notion draws attention to the need that health professionals have to master communication across many different fields, but above all, with different groups in society. In situations of disaster, new extended “trading zones” emerge where the health-related issues are discussed, negotiated and dealt with. This means that health professionals have to develop new kinds of “language skills”, i.e. learn how to express their views in context-sensitive manners as well as learn to listen to the ways in which people think and express their concerns (see Gorman 2010). This in turn would allow them to gradually acquire an expert position in such situations. It also means acknowledging that under new circumstances expertise cannot be regarded simply as a given, but needs to be established over and over again. These processes should not be seen as throwing the validity of medical authority into question, but rather as opportunities for widening a medical professional’s view on the problems at stake. Patients and their families also hold specific forms of expertise and it is essential to find creative ways of using these different kinds of expertise in order to develop solutions to health related problems.

The second kind of expertise to be developed is **contributory expertise**. Health professionals, particularly in situations of disaster, cannot expect to obtain a straightforward, ready-made overview of all necessary information in order to be able to act. They will have to work with incomplete, often shaky information, engage with local forms of knowledge and be imaginative in developing potential solutions. In that sense, they are expected to become active contributors to developing a better collective understanding of the socio-technical problem at stake – on both a technical and social level. Health professionals hold a reservoir of expertise – be it tacit or explicit – about what such a disaster

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10 Collins and Evans (2007) in their extensive analysis of expertise use thes notion of interactional and contributory expertise in a different way than the one outlined here.
means for the many individuals they have encountered and for the nation as a whole. This means that they have to learn to transgress their classical areas of expertise and become co-investigators of the techno-natural disaster.

Finally, health professionals have to develop adaptive expertise, i.e. the capacity to address new and complex problems “by creatively transferring and transforming elements of diagnoses, interpretations, and solutions across contexts” (Hackett and Rhoten 2009).

Overall, situations of disaster should remind us that (1) living in a techno-scientific world also needs new ways of dealing with expertise, and that (2) health is not only a medical phenomenon, but needs to be understood as a complex socio-medical phenomenon. This means that medical education should be open to new ways of learning, allowing not only to reproduce previously acquired knowledge, but also explicitly invite health professionals to think in terms of new and unexpected situations, not caused from within the system but by the societal context in which they work. It calls for a broadening of education of health professionals with a critical review of their understanding of expertise whilst also focusing more on the development of these new forms of expertise. This will allow a better response to challenges posed in complex situations such as techno-natural disasters.

Questions and Answers

(1) What different kinds of expertise can be distinguished?

i. Adaptive expertise requires an individual to develop a conceptual understanding that allows the "expert" to invent new solutions to problems and even new procedures for solving problems; demonstrate flexible knowledge handling; understand the types of learning trajectories that may allow practitioners to break free from routines when necessary.

ii. Contributory expertise is the ability to contribute to analysing and solving a specific problem by drawing together different sets of information from research as well as from other information sources.

iii. Counter expertise is constructed by members of civil society in order to control classical expertise as well as to allow for alternative interpretations of risk and of the information collected by classical institutions.

iv. Interactional expertise emerges through complete immersion in a specific problem context; an expert community learns to use the language of another expert community (e.g. medical practitioners and lay-groups engage in an exchange); describes the capacity to actively engage with the knowledge and experience available in another community.

v. Routine expertise means the mastering of well established procedures of finding solutions in such a way as to become highly efficient and accurate.
(2) **What is a thought collective and what a thought style?**

A thought collective is a group of people who share a specific way of seeing the world – in science, thought collectives are equivalent to scientific communities. A thought style refers to methods and theories which organise the way we see and try to explain the world. Every person can be a member of different thought collectives, e.g. a person can be part of a medical thought collective, but also a thought collective of environmental activists.

(3) **What is meant by “paradox of expertise”?**

In exceptional situations, when a feeling of stability is of utmost importance as is the case in disasters, expertise is increasingly sought for and used as a source for making choices, yet it is simultaneously contested.

(4) **What role do media play with regard to expertise?**

Media plays an essential role in framing our understanding of problems, and the stakes that are associated with them. Social media and the internet are important information sources that amplify the voices and interpretations available, thus playing an important role in trust relations. Furthermore, the media becomes an important player in developing collective and individual responses to techno-natural disasters, unfolding moral narratives and distributing responsibilities. It is thus essential not to simply discard media reports, but to analyze them as alternative forms of understanding what is at stake – even though one might not share the view.

(5) **What is special about a techno-natural disaster with regard to the question of expertise?**

In techno-natural disasters, well-functioning articulations between the technological and the social are dramatically disrupted, and both experience and knowledge are lacking about how to restore order in such a new and complex situation. In addition, information is generally scarce as well as unstable; yet decisions need to be taken quickly, thus challenging expertise to a great extent.

The challenges of expertise in techno-natural disaster are as follows:

i. It is difficult to put together a reliable set of data which seems from hindsight the most relevant.

ii. Data gathering and interpretation has to be performed under extreme circumstances and in a swift manner.

iii. Skilled persons capable of reading and interpreting this data are often not widely available.

iv. A balance has to be found between adequate information and overflow of information, as the latter can do more harm than good and create a situation of disinformation. Decisions have to be made about what information to disseminate and...
to which audiences, and finally, derived from the knowledge acquired, which corresponding actions need to be taken.

References


Further Reading


CHAPTER 2

DISEASE, ILLNESS, AND SICKNESS: A CONTESTED BOUNDARY

Heiner Fangerau\textsuperscript{11}, Azura Z. Aziz\textsuperscript{12}, Rethy Chhem\textsuperscript{13,14}

Summary

Defining health is a difficult task. According to their intentions, institutions like the World Health Organization (WHO), health insurance carriers or persons like employees or employers use different definitions. These range from global concepts to narrow, operationalized classifications. Similarly, different, sometimes contradicting concepts of disease, illness and sickness exist. Whereas illness is often defined as the subjective experience of feeling ill, the term disease is often used to describe the application of objective criteria in attempts to demarcate health from disease. What counts as objective criteria is axiomatically stated by science and medicine. It is inherent to scientific approaches that the limits of concepts, such as concepts of disease, are steadily under discussion. Sometimes, however, even basic understandings of either a disease or models of a disease’s etiology are contested. We will use the example of discourses about radiation and its effects on health and disease in order to illustrate the cultural and historical dimensions of disease concepts which affect the alleged objectivity of scientific definitions of disease and illness.

Learning Objectives

After reading this chapter the reader will be able to:

1. Describe the concept of disease - disease, illness and sickness
2. Explain substantial and gradual disease concepts of medicalization
3. Discuss discourses on radiation safety

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Introduction

It remains an unresolved question whether health, according to the definition by the WHO from 1946 as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity,” can ever be fully achieved (Grad 2002). Although there appears to be transnational agreement that health is far more than the absence of illness, any concept of health is in some way still linked to concepts of illness and disease (Rothschuh 1975), and what is understood as “not well-being” has several cultural determinants subject to change over time. According to the German social law focusing on health insurance, for example, unhealthiness is an irregular physical, psychological or mental condition resulting in an inability to work (Niehoff 2008, 37). Of course, from a subjective perspective a person who is able to work does not necessarily feel healthy. Thus, it is difficult to come to a universal definition of unpleasant conditions such as “illness” or “disease”. The different facets of health, or more accurately “unhealthiness”, have been thoroughly discussed by several authors like Christopher Boorse, Lennart Nordenfelt, Hans Georg Gadamer or Talcott Parsons to name but a few (for an excellent bibliographic overview see Hofmann 2002). These discussions have led to different—and still disputed—concepts of human ailment. Nevertheless, a triad of illness, disease and sickness proposed by Andrew Twaddle in the late 1960s, and defended in an influential analysis by Björn Hofmann (2002), has proven to be very useful and intuitively intelligible.

In the following we will refer to this triad in order to describe a four-dimensional concept of disease, which results in frontiers of the normal and the pathological that may change over time (the fourth dimension) with the consequence that these borders need to be negotiated in medical and social discourses. In doing so we (like the other cited authors) are well aware that this model is based on a western tradition of reasoning about medicine. We will use the example of discourses about radiation and its effects on health and disease in order to illustrate the cultural and historical dimensions of disease concepts which affect the alleged objectivity of scientific definitions of disease and illness. After a short introduction into the “concept of disease”, we will sketch the historical development of disease concepts related to radiation. One has to be aware that historical nuclear narratives may imply responsibility and that their contents can be challenged by different perspectives (Hamblin 2012). These different perspectives may be brought about by conflicting concepts of disease, illness and
sickness as we will illustrate with this short historical sketch and finally a case study about the hormesis concept as an example of a contested boundary of disease and health.

2.1 A Concept of Disease

Following the post-war debates surrounding the concepts of health and illness, the subjective notion of feeling unwell in physical or psychic terms is usually referred to as “illness”, whereas the objectively diagnosed illness is called a “disease”. The objective diagnosis in this understanding is performed by professional medical scientists or physicians according to certain, axiomatically defined medical criteria that establish a nosology. An “illness” needs to be acknowledged as a “disease” in order to result in other people’s actions to help in overcoming the unpleasant status or to recognize it as a status in which another person might need help. This social perspective on human suffering/ailment is often referred to as “sickness”. To put it in Hofmann’s (2002, 657) words: “Disease is negative bodily occurrence as conceived by the medical profession. Illness is negative bodily occurrence as conceived of by the person himself. Correspondingly, sickness is negative bodily occurrence as conceived of by the society and/or its institutions. Occurrence here means process, state or event.” We would even extend this definition to mental occurrences as well.

Concepts of illness, disease and sickness in this sense might be contested by representatives of either of the systems involved in demarcating unhealthy states (medical profession, individual patients, society at large), especially if their interpretation is considered as unstable from a cultural and temporal (historical) perspective. Not only taxonomies of diseases or social (hidden or apparent) institutions but also several personal physical and psychological experiences are bound to cultural and historical contexts (Stolberg 2003, 29). As a consequence, we need to add a diachronic perspective, a temporal dimension to the three perspectives on unhealthiness (cf. Fangerau and Martin 2011).

If people feel ill due to an occurrence, state or event and parts of the society also acknowledge this state as (resulting in) sickness, pressure is put on physicians to discuss their concepts of the disease and to do research on the classification of the disease (nosology). In this case the medical system is only able to fulfill its task if it at least tries to find disease criteria that fit and explain the feeling of illness and sickness in order to stabilize and harmonize the ‘illness, disease, and sickness’ triad. The same is true for the opposite situation.
whereby a disease has been defined by the medical profession according to certain criteria which is generally not accepted by patients or society at large (cf. Brown 1995).

As a consequence, medical scientists are urged to arrive at definitions of diseases. In doing so, two dominant directions of disease concepts seem to have been prominent in the past. They can be classified as either substantial or gradualistic approaches to disease classification. Far more terms for this dichotomy exist and other dichotomies like ontological vs. nominalistic or realistic vs. constructivist have been discussed, but essentially they address the same problem (Hofmann 2001). Diseases are either understood as substantial: consistent, fixed entities similar to botanical taxonomies (like in Thomas Sydenham’s nosology), or they are understood as gradualistic: a historically contingent demarcation of a transition phase or point on a gradual scale which ranges from the normal to the pathological at each end (cf. Cohen 1953; Cutter 2003). These two extreme views can be reconciled, or they at least share common features: whereas health and disease are clearly defined on both ends of such a scale, the transition point at which a condition becomes a disease needs to be defined; whereas a broken bone clearly belongs to the pathological end of the scale, the question of when usual drinking transgresses the diagnostic border to alcoholism is such a gradualistic problem that needs to be negotiated. The definition of where the normal and pathological spaces are on this scale (cf. Canguilhem 1978), including the nosological criteria for making a condition a disease, however, relies on medical knowledge, medical technology and contexts of illness and sickness in a given era. Scientists do not define diseases in an open space: their methods, their reasoning and their results are embedded within a social and technological context. As with other individuals they are driven by interests, resources and public demands. As a consequence, some authors coined this interdependence of medical science and society “the social construction of medical knowledge” (Jordanova 1995).

A gradualistic understanding of disease can especially result in dispute. If conditions defined by medical scientists as diseases are not generally accepted by patients and the society as such, some authors refer to the model of medicalization to describe these situations. “Medicalization” is basically a value free term to explain the extension of the medical sphere into areas which have been previously outside of its realm (Conrad and Angell 2004). Nevertheless, several critics of medicine and its approaches have used the term with negative connotations, hinting to the potential danger of defining diseases as conditions which they regard as normal (see e.g. Illich 1975a, b). If conditions are generally accepted as pathological but the medical definitions are disputed or the transition point is under attack or
medical science does not offer a disease definition at all we tend to speak of “contested diseases” (Figure 2.1). Generally, what is considered a disease is contested in some situations.

Figure 2.1: Dimensions of Unhealthiness (modified from Brown 1995)

**Applied Examples using Figure 2.1**

- **Scenario 1:** A person feels ill 24 hours after exposure to high amounts of ionizing radiation, the society acknowledges him or her as sick and a physician is able to diagnose the disease as acute radiation syndrome. The three aspects of unhealthiness are in agreement and no conflict about what is pathological arises. In this case, one can presume that even from a diachronic perspective the harmony of the three aspects might be quite stable. If, however, one aspect is not in accordance with the others, a dispute might occur, which results in processes of adaptation or persuasion triggered by the representatives of the perspective on unhealthiness not met.

- **Scenario 2:** Society does not acknowledge the ill-being of a person. The person tries to find an ally in the medical profession, asking for a disease concept that backs his or her claim of being sick. An example might be offered by discussions about compensation for delayed effects of radiation, when institutions or political authorities contest the illness claims of individuals after exposure (Cable, Shriver and Mix 2008).

- **Scenario 3:** At the same time society might define a person to be in a state of sickness which does not result in the person’s ill-being. In the context of radiation, neighbors might tend to avoid contact with nuclear scientists because they fear to be “infected” with radiation received by these scientists. Another illustrative example are so-called “social deviances” (what counts in a certain culture at a certain point of time as such): for instance, historic interpretation of lifestyles like homosexuality resulted in changing frontiers and blurred borders within and between these aspects of human suffering (Conrad 1980; Conrad and Angeli 2004).
The history of debating the effects of radiation on human health offers various examples of the negotiations surrounding “contested diseases”. In the following we offer a brief, general, “standard” narrative of discourses on radiation safety. However, one has to be aware that historical nuclear narratives may imply responsibility and that their contents can be challenged by different perspectives (Hamblin 2012). These different perspectives may be brought about by conflicting concepts of disease, illness and sickness as we will illustrate with a case study. Additionally, we will illustrate how experts disagree about what a disease is by using the example of current debates surrounding the concept of hormesis.

2.2 Discourses on radiation safety – a historical overview of disease concepts related to illness and sickness

A short time after Wilhelm Conrad Roentgen had reported his discovery of x-rays in 1895 the first reports highlighting serious side effects from exposure to ionizing radiation were published. Over the next few decades, reports continued to implicate the extensive use of x-rays in such somatic responses of skin irritations, sterility, leukemia and cancer. In 1927 Herman Joseph Muller added his findings that genetic mutations could be induced by x-rays in Drosophila. His results also indicated that there was no threshold level of radiation below which no damage was observed (Walker 1989; Seelentag 1985, xiii). The possible hazards resulting from radium in the 1920s and 1930s entered the public domain when there were reports on cases of women who died from the damaging effects of radium that they had ingested by licking the tips of brushes they used to paint the luminous dials of alarm clocks. In a further example, in 1932, the media informed the public about radium poisoning associated with the death of a well-known playboy from Pittsburgh who had tried to rejuvenate himself by ingesting large amounts of radium enriched water over a period for more than four years (Piispanen 1995, 97; Macklis 1990). At this time, against first hopes of radiation having healthy effects, evidence was such that it was accepted that high doses of radiation would result in severe radiation effects.

However, from early on the contested boundary was found to be related to assumptions regarding low levels of ionizing radiation. A first attempt at defining a “tolerance” dose of
radiation which could be received without evidence of damage – meaning the dose below which there is no evidence of a transition from a physiologically tolerable condition to a disease – was made by the American Arthur Mutscheller. He defined a “skin erythema dose” to quantify biological radiation effects in man and added a safety factor which resulted in him concluding that a dose not exceeding 1% of the “skin erythema dose” within a month would be “tolerable”, meaning, that it had no sustainable biological effect (Seelentag 1985, xiii). However, there was immediate disagreement among experts regarding this tolerance dose and during the following years several radiation protection groups and committees on an international level suggested different tolerance doses (Brodsky, Kathren and Willis 1995). Due to limited empirical evidence no group “claimed that its suggested tolerance dose was definite.” What was agreed was “that exposure below the recommended limit would be unlikely to cause permanent damage to an individual in normal health” (Walker 1989, 665).

In the middle of the 20th century, Hiroshima and the consequences of the atomic bomb brought a “new era for radiation safety”. Radiation safety issues became more complex because many new, ‘man-made’ radioactive elements and isotopes were created through nuclear fission. There was the realization by scientists that, even if nuclear weapons were never again used in warfare, the civil use of nuclear energy in power plants would mean an exposure of a large number of people to low dose levels of radiation. As J. Samuel Walker, the historian of the US Nuclear Regulatory Commission, stated: “Radiation protection had broadened from a medical issue of limited proportions to a public health question of, potentially at least, major dimensions” (Walker 1989, 665). In response to these premises the international boards and committees lowered their exposure limits in an attempt to establish protection guidelines for the general public. The fallout controversy during the late 1950s again highlighted the significance of radiation protection of the public.

Atmospheric bomb testing by the USA, the Soviet Union, France and Great Britain produced radioactive fallout that reached populations far away from the areas of testing, with an impact on health and the environment in North America, Siberia, Australia and the Pacific Islands (World Uranium Hearing 1993). A public controversy followed, supported by the media with news reports and magazine articles. Radiation hazards became a political issue and became a component of political campaigns. To quote Walker’s narrative again: “As a subject of public concern, radiation moved from the rarified realms of scientific and medical discourse to the front page” (Walker 1989, 666). Scientists and medical experts disagreed about the risks, and the possible risks were balanced against possible benefits beyond the scope of biological
radiation hazards. In the Western discourse the risks of fallout were juxtaposed with the risks of being behind the Soviet Union in the arms race. National security was the dominant discourse that overshadowed conversations about nuclear hazards and scientists defended their actions on that basis. To add to this, contradictory notions of tolerance doses, “linear no-threshold” and “threshold” models of the relationship between radiation damage and dose were under discussion. Nuclear scientists were unable to give clear accounts of the resilience or repair functions of human cells after exposure to radiation.

This crisis re-emerged when, after the establishment of nuclear power plants, questions of the health effects of low-level radiation entered the public discourse again with a long sustained drive. However, the fundamental difficulty remains that a rather low radiation-induced cancer is almost never pathologically distinguishable from a cancer due to other causes and that the numbers of radiation-induced cancers that might be due to low level radiation are often too small to distinguish from those occurring ‘naturally’. As a consequence in most cases it is unclear whether any particular cancer was caused by radiation, although recent findings support the idea long-term exposure to low dose radiation increases the risk for leukaemia (Abbot 2015). This is why it is so difficult to understand and explain the risks. Resulting latent public anxieties and the associated dissension among scientific experts are nurtured by the debates accompanying the use of nuclear energy per se and this continues until today. The yet-unsolved problem of nuclear waste and the recent disasters of Chernobyl and Fukushima with their global public impact brought this crisis to center stage.

**Case Study: Radioactive fallout and local populations – Nuclear testing in the Soviet Republic of Kazakhstan** (Werner and Purvis-Roberts 2007)

“...One of the scientists we interviewed suggested that radiation is just a small factor affecting public health. From his perspective, local health patterns in the villages are best explained by poor diets and psychological stress associated with radiophobia. He added that he himself had been exposed to more radiation than most villagers without any harmful impacts on his health. Since it is still impossible to acquire health data for the residents of Kurchatov, it is difficult to state whether this population has also experienced health problems associated with radiation exposure … the USSR Ministry of Health collected data through a series of medical expeditions to the villages surrounding the test site (Shkolnik 2002: 100-114). With all of this data, doctors and scientists investigated the correlation between radiation exposure and certain health problems, including cancer and birth defects. Due to the need for secrecy, however, patients could not actually be told that their doctors were studying the impacts of radiation exposure. The scientists who prepared the Shkolnik volume indicate that the Soviet government was very interested in monitoring the health of the local population, but they fail to indicate the extent to which the government provided effective treatments for these populations.”

This is a clear case of a contested boundary whereby the local population is facing an illness that is associated with radiation exposure, yet the illness is not recognized as a disease by doctors and scientists, or as a sickness by the State due to the need for secrecy in the name of national interests.
2.3 Hormesis and the equivocal low level radiation effects

The 2011 Fukushima Daiichi accident revived a scientific discourse that paradigmatically reflects the example of a crisis in expertise which is caused by inconclusiveness of scientific findings and the varied interpretation of these findings – in the form of contested diseases. This is the scientific and public discourse about a phenomenon named “hormesis”, which defends a favorable biological response to low level toxins and describes the possible stimulating effects of low level radiation.

A few days after the Fukushima Daiichi accident the American commentator, Ann Coulter, stated on TV and on her homepage: “With the terrible earthquake and resulting tsunami that have devastated Japan, the only good news is that anyone exposed to excess radiation from the nuclear power plants is now probably much less likely to get cancer. This only seems counterintuitive because of media hysteria for the past 20 years in trying to convince Americans that radiation at any dose is bad. There is, however, burgeoning evidence that excess radiation operates as a sort of cancer vaccine” (http://www.anncoulter.com/columns/2011-03-16.html. Last accessed 2014-02-24). The evidence she is referring to, however, is highly contested and not linked to excessive dose but to low doses. Particularly, the interpretation of “stimulating effects” of low dose radiation effects as positive, neutral or negative is under discussion. Opposing the currently mostly accepted linear no-threshold model of radiation effect, hormeticists believe that low levels of radiation have positive effects on human health, an effect also observed (in relation to an intended effect) with some chemicals and alcohol.

Possible stimulatory effects of radioactivity have been examined since studies on ionizing radiation began. Studies in plants and animals very soon suggested these effects (Calabrese and Baldwin 2000). Attempts were made to use ionizing radiation to synthesize life from inorganic matter. The above mentioned radium therapy for rejuvenation practiced during the 1920s was a result of these reports. In popular culture this idea was, for example, highlighted in the 1930s serial called “The Phantom Empire”, in which a dead woman was “brought back to life in a ‘radium reviving room’” (Piispanen 1995, 96).

As discussed by Macklis and Beresford, the politicization of medical and industrial uses of “nuclear energy and radioactive materials” resulted in a shift of “the radiation hormesis controversy … to disagreements over the positive or negative implications of the putative ‘stimulatory effects’… for the ecosystem or for the population as a whole” (Macklis and
Beresford 1991, 351). Even among the hormeticists there is disagreement about the medical consequences of their conjectures. Generally they propose hormetic effects on the molecular and cellular level as well as on the level of organism as a whole. Explanations for hormetic effects of low level ionizing radiation include the stimulation of DNA repair, the stimulation of immune responses, its function as a vital life force, the selective inactivation of senescent parts of an organism, and the production of an evolutionary favorable selection pressure that benefits a species (Macklis and Beresford 1991, 352).

While critics of hormesis state that “there exists no credible epidemiological evidence for” the conjecture that “exposures to low doses of naturally present or man-made ionizing radiation must have beneficial effects on human health” (Nussbaum and Köhnlein 2003, 706; Nussbaum and Köhnlein 2011) hormeticists offer several epidemiological case studies that seem to prove hormetic effects. They say for example that “1) incidence of solid cancers decreased in 21,500 exposed workers at Mayak, a Russian plutonium production complex in Chelyabinsk oblast’/Ural region. 2) The total cancer deaths in 8,600 cleanup workers at Chernobyl (who received an average of 5 cGy) were 12% lower than that of the general Soviet population. 3) The leukemia death rate in 96,000 nuclear workers (in three countries) exposed to over 40 cSv was only half of that predicted. 4) No increased cancer was found in 222,400 radiologists and radiation technicians who received more than 20 cGy in 20 years,” etc. (Luckey 2006, 173). The critics of hormesis counter these findings with contradicting examples and/or different interpretations. They are either “struck by the paucity of convincing data and by the lack of expert consensus concerning the health implications of what data are available” (Macklis and Beresford 1991, 357), or they summarize: “All the ‘proofs’ and ‘studies’ the crusaders for increased allowable radioactive exposures have continued to cite represent either invalid or misleading interpretations of flawed epidemiological studies” (Nussbaum and Köhnlein 2000, 6).

It may be the case that this example of a contested disease concept has two intertwined reasons. On the one hand there is no consensus because the data collected are contradictory, inconclusive and contingent. On the other hand non-scientific values and political considerations guide the interpretations (Elliot 2011). Both parties accuse the other of answering selective interests and following lobbies other than those of science. Hormeticists argue that the linear no-threshold model has resulted in fear, radiophobia and increased costs, all of which could be overcome by the acceptance of the hormesis model (Kauffmann 2003; Jaworowski 1999; Jaworowski 2010), and that psychological warfare during the Cold War,
lobbying by fossil fuel industries or the interests of the media in public fear fuelled the rejection of hormesis. In their eyes “efforts to minimize exposures to humans to the lowest achievable level or to a level below regulatory concern are counterproductive to health, diverting resources from more worthy endeavors” (Kauffmann 2003, 405). At the same time scientists arguing for the linear no-threshold model accuse hormeticists of being influenced by interests of the nuclear power industries and governments trying to calm their citizens after man-made nuclear accidents (e.g. Nussbaum and Köhnlein 2011).

These multi-layered controversies surrounding the idea of hormesis reflect a crisis of expertise in knowledge of radiation health effect, leading to contestation of the definition of diseases associated with radiation. In addition to the concept of hormesis, the Fukushima Daiichi accident has also resurrected scientific debates about health effects of low levels of ionizing radiation. Although the citizens of the Fukushima region are monitored, and although scientists are trying to get results regarding low dose radiation effects as a consequence of radiation in Fukushima, a report by Normile (2011, 910) in the journal Science laconically stated that “some researchers doubt that any study in Fukushima, no matter how well devised, will reveal much”. A researcher is quoted in this report that he “[doesn't] think anything [done in Fukushima] is going to resolve” the debate about the linear no-threshold model. However, this also means that the “gnawing fear” of many Japanese “that low levels of radiation could harm their children” cannot easily be alleviated.

2.4 Conclusion

Negotiating the contested boundary of disease, illness and sickness is an ongoing process, especially in situations as highly sensitive and politicized as nuclear energy and the Fukushima Daiichi accident. As such, various stakeholders along with their social, cultural, political and historical implications must always be considered: the individual(s), physicians/scientists, publics and the state. This has been illuminated by the cultural and historical discourse of radiation health effects, which have affected and continue to affect the alleged objectivity of scientific definitions of disease and illness. Care must be taken to avoid medicalization of conditions in defining contested diseases because of possible inadvertent implications in social and medical policy. At the same time the leveling or trivialization of potential health risks from radiation for the sake of political or public interests should be avoided in the interest of potentially affected individuals.
Questions and Answers

(1) How can we term “unhealthiness” or lack of health?
The different facets of “unhealthiness” are disease, illness and sickness – depending on the perspectives of medical professionals, patients and society, respectively – over time.

(2) What are the two main directions of disease concepts?
The two approaches to disease classification are substantial or gradualistic. Gradualistic understanding of disease – under which radiation diseases are categorized – can result in dispute and medicalization. This is especially the case with the growing role of social media and the internet, which can be explored further.

(3) How can we approach low levels of ionizing radiation from a historical point of view?
The multitude of approaches includes “tolerance” doses, “linear no-threshold” and “threshold” models, and radiation hormesis. Each approach has been influenced by cultural, political and historical concerns.

(4) What other contested diseases apart from radiation can we apply this framework to?
This can be applied to physical or mental diseases associated with environmental and occupational exposures in disasters and events which include but are not limited to toxic chemicals, gas leaks, heavy metal poisoning and fossil fuels.

(5) Why is there no consensus among scientists about the effects of low doses of radiation on human health?
Scientific long-term studies on the consequences of radiation in Chernobyl and Fukushima among others are on-going. However, health effects of low dose radiation are likely to continue to be contested due to the inconclusive etiology of radiation diseases, differing interpretations of epidemiological data and political/economic interests influencing the selection and presentation of data.

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CHAPTER 3

PERCEPTION OF RADIATION RISK: THE ETHICAL DIMENSIONS OF COPING WITH DISASTER

Deborah Oughton\textsuperscript{15} and Penelope Engel-Hills\textsuperscript{16}

Pain is inevitable; suffering is optional.

Haruki Murakami, \textit{What I Talk About When I Talk About Running}

Summary

The objective of this chapter is to address the factors that influence risk perception and discuss recommendations for how a holistic understanding of these factors can help health care practitioners in disaster and risk management. One important message is that it is a mistake to assume that public aversion or fear of radiation risks is due only to a misunderstanding of the probabilities of harm. Risk perception is complex and many factors have strong ethical relevance. We will consider three values that influence the way people perceive risk: autonomy and respect for personal control; justice and the distribution of risks and benefits; and community values and societal impact. With respect to control, in addition to a fundamental ethical respect for dignity, there is an important psychological and physiological link between coping and stress. Hence management practices need to be aware that enabling personal control and empowerment will positively influence the response of an individual to a disaster. The consideration of justice with regard to the distribution of risks and benefits must include awareness of the challenges of discrimination and victimization as well as the need for the protection of the vulnerable members of society, such as children and

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the elderly. In addition, community and societal impacts extend the notion of well-being to encompass not only individual physical health but also mental health and social well-being. Therefore in a holistic approach to disaster risk management there would be the reduction of the risks of physical harm, and in addition, measures will be taken to address psychological health and societal recovery.

**Learning Objectives**

After reading this chapter the reader will be able to:

(1) Recall some of the societal and ethical factors impacting on the perception of risk
(2) Express relevant societal consequences of radiation accidents
(3) Recognize that public aversion to radiation risk is not only due to misunderstanding of the probabilities of harm
(4) Defend management of radiation risk beyond the reduction of exposure

**Keywords:** risk perception, disaster management, risk management, ethics, justice, uncertainty, personal control

**Introduction**

In 1971, Professor Jay Weiss carried out what are considered to be classic experiments on the links between stress, control and coping (Weiss 1972). In one experiment, electric shocks were administered to pairs of caged rats. Both cages were linked to the same circuit, but in one cage the rat could switch off the electricity by turning a wheel. Even though the same level and duration of shock was administered to both rats, the group having no “control” over the stress showed significantly higher levels of distress (ulcers, loss of hair, weight loss, etc.). The experiments are seen to be a demonstration of the powerful physiological and psychological link between personal control and stress-related illnesses.

The objective of this chapter is not to elaborate on the link between control and stress, but rather to argue that these issues also have strong social and ethical relevance to the way people perceive risks. Furthermore this chapter does not intend to comprehensively cover the topic but aims to provide a stimulus for debate, discussion and further reading on perceptions of risk from a disaster, with specific reference to radiation accidents but allowing application to other forms of emergency. Risk is in part quantifiable but also a social construct that is
interpreted differently by people in various situations and environments (cultures) – we need to recognise this to achieve effective management (including community participation). The main objective is to demonstrate that radiation protection, as well as health education, must address societal and ethical issues as part of the holistic understanding (and holistic approach to risk management) of factors that impact on radiation risk perception and associated mental health and recovery from nuclear and radiological emergencies.

3.1 Risk Aversion, Public and Expert Perceptions of Risk

Rational Emotive Behavior Therapy (REBT) is based on the premise that psychological and emotional problems are due to irrational and illogical thought processes about an incident rather than being a result of the actual event (Banks 2011). Analysis of the Chernobyl and the Fukushima Daiichi accidents have suggested that fear of radiation and the resultant psychological stress lie behind the major health impacts seen in affected populations (IAEA 1991; Brumfiel 2013; Yasumura 2014), and that these effects are far greater than the direct health impacts of the radiation exposure. It is not uncommon to hear claims that this fear is driven by an irrational perception of the risk, as well as public misunderstanding of the risks associated with radiation exposure. The public accepts risks associated with driving cars, drinking alcohol or eating seafood containing heavy metals, but rejects the relatively low risks associated with radiation exposure largely because they interpret risk without any personal benefit as unacceptable. People also tend to be more tolerant towards natural radiation exposures (e.g. radon) or medical uses of radiation than man-made sources (Oughton and Howard 2012). Similar accusations of irrationality have been made against the public perception of biotechnology and genetically modified organisms. Other experts have suggested that the fear is fuelled by poor communication, mismanagement of radiation risks, or media hype (Jaworowski 1999; Ng and Lean 2012).

It is true that people misunderstand the probabilities; however, numerous studies of the psychological and psychometric factors that influence risk perception show that the situation is more complex than this alone. Public or lay perceptions of risk vary widely between people, and can differ from the calculated, technical approach to the assessment of risks. Whereas an expert will often tend to rank risks as being synonymous with the size or probability of harm, risk tolerance or aversion is dependent on many additional characteristics (Slovic 1996; Drottz-Sjöberg and Sjöberg 1990). Many of the characteristics have strong psychological as well as societal and ethical relevance (such as control,
voluntariness and distribution of risks and benefits). The conclusion is that it is a mistake to dismiss public anxiety towards radiation risks as being “irrational” or “wrong” (Drottz-Sjöberg and Persson 1993). Irrational beliefs can result in emotional disturbances such as anger, guilt, aggression and withdrawal (Banks 2011). This is an important message for management and health care practitioners in order to counteract the assumption by many experts that the education of the public about the risks is all that is required in order to reduce aversion to the exposure.

3.2 Factors impacting on Risk Perception

3.2.1 Autonomy, Personal Control and Consent

People tend to be less tolerant of risks that are imposed without their choice or personal control. The phenomenon applies to a range of different risks and actions, such as driving a car compared with flying, and why comparing risks of radiation exposure to smoking is not a recommended form of risk communication. Personal control is closely related to the fundamental ethical value of autonomy (i.e. respect for the free-will of individuals), dignity, integrity and individual rights. It is also linked to the requirement for free informed consent related to medical risks (Table 3.1).

Uncertainties are an important aspect of radiation risk perception. More people have died from earthquakes and tsunamis than from exposure to radiation. But after a tsunami people could start the process of rebuilding their life. In contrast after a nuclear power plant accident the situation is more ambiguous and uncertain. The levels of contamination can be initially very unclear, and the long term risks associated with the onset of a detrimental effect, in this case cancer, can take decades. Anxiety is raised by the lack of answers to questions such as: how long before I can return home—if at all? Would I want to? In the case of the Bhopal accident—with about 3000 immediate fatalities and more than 100,000 people with medical problems—the effects were quickly identifiable, and the accidental exposures mainly acute rather than chronic (Broughton 2005; Dhara and Dhara 2002). After a release of high levels of radiation, the time for recovery is longer and the feeling of helplessness greater than after most chemical or natural catastrophes. The immediate devastation and loss of lives may be far worse from the earthquake and tsunami, but the uncertainties, protracted duration of the problems and lack of autonomy can be greater in the case of a radiation incident.
Radiation risks represent a class of environmental risks over which people feel a particular lack of control (Slovic 1996), and particularly those associated with exposures following accidents. The public is dependent on information from authorities or media, and has little personal choice or control over the situation. The public has to deal with the risks from the exposure and in addition they must cope with the effects of the measures imposed to reduce exposure such as relocation, bans on agriculture or access to amenities. The latter represent decisions taken at central level. They are disruptive and infringe upon liberty and free choice.
Table 3.1: Overview of ethical values impacting on risk perception and links to other biomedical ethical principles.

<table>
<thead>
<tr>
<th>Ethical Values</th>
<th>Impact on Risk Perception</th>
<th>Links to Biomedical Ethical Principles(^1)</th>
<th>Main Underlying Ethical Theories(^2)</th>
<th>Other areas of relevance for medical ethics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autonomy (dignity, integrity)</td>
<td>Personal control or consent over the risk. Public or patient empowerment over the situation</td>
<td>Respect for autonomy (a norm of respecting the free-will and decision-making capacities of self-governing persons)</td>
<td>Deontology, Kantian ethics, rights-based theories</td>
<td>Patient free informed consent; Doctor or health worker integrity</td>
</tr>
<tr>
<td>Welfare (consequences and community values)</td>
<td>The size of the risks, harms and benefits; Impact on the broader societal aspects such as community structure or demographic changes</td>
<td>Nonmaleficence (a norm of avoiding the causation of harm) Beneficence (a group of norms for providing benefits)</td>
<td>Utilitarianism, consequentialism, teleological theories, virtue based ethics</td>
<td>Avoidance of causing harm to patients. Duties to help and reduce suffering. Ethics of care. Community and public health ethics</td>
</tr>
<tr>
<td>Justice (equity, equality)</td>
<td>The distribution of risks and benefits within society or over time</td>
<td>Justice (a group of norms for distributing benefits, risks and costs fairly)</td>
<td>Contractarianism(^3)</td>
<td>Distribution of healthcare resources Costs-effectiveness of various treatments</td>
</tr>
</tbody>
</table>

1 – The four main biomedical ethical principles as proposed by Beauchamps and Childress (1979). See chapters 5 and 6 for further discussion.
2 – The principle ethical theory associated with the ethical value. Note that ethical theories can find other values ethically relevant. For example, utilitarians recognize the importance of autonomy or freedom, but this is because of the welfare of utility it brings to society, rather than respect for autonomy as a fundamental ethical value in itself. The description of ethical theories can be found in Beauchamps and Childress (1979), or Sandel (2010)
3 – For example, Rawls (1971).

Control is part of the reason why people are less concerned over medical radiation exposures (which are largely voluntary and for an obvious personal benefit). It is also why actions that
increase personal understanding, such as provision of dosimeters or counting equipment are considered positive and can help populations in coping with disaster (see case study on personal dosimetry projects in Chernobyl and Fukushima, and discussion on risk management and communication below).

Informed consent is also important for workers that might be exposed to chemical and/or radiation risk. This is particularly significant if lower paid workers are employed to carry out remediation or decontamination, as it has been suggested that the necessary conditions for free-informed consent are often violated for these groups (Bullard 1990). The increased risk may justify some form of compensation via higher wage premiums, but compensation itself can raise questions of whether or not this may coerce people into taking risks they would otherwise not have (Bullard 1990; Shrader-Frechette 2002). Both ethically and legally, most people would agree that affected persons have a right to some form of compensation for damages; either those resulting directly from the disaster or as a result of remediation. Experience from Chernobyl illustrates the problems of compensation in promoting the “victimization” of affected populations (Oughton et al. 2004; UNDP 2002; IAEA 2005). In Fukushima, higher levels of compensation were paid for evacuees of the nuclear accident as compared to the tsunami, leading to reports of resentment between the different groups.

Case Study: Chernobyl and Fukushima – personal dosimetry projects

Provision of counting equipment and independent monitoring are methods that have been successfully applied in Chernobyl affected communities. A study carried out in Belarussian villages concluded that the approach not only resulted in reducing exposures with minimal social and psychological side effects, but was also more economically cost effective than the standard “top-down” management procedures (Dubreuil et al. 1999). A stakeholder study following up on Norwegian farming communities most affected by Chernobyl fallout indicated that access to local food monitoring stations was particularly important (Liland et al. 2010).

The interest for access to personal dosimeters and information on personal doses has been widespread in Japan following Fukushima. When combined with access to experts to help interpret results, such actions can help empower populations. Ethically, procedures that involve the populations themselves can help promote the principle of informed personal control over radiation risks. However, it should be noted that in some cases, information policies that reduce anxiety over radiation might actually lead to an increase in exposures,
3.2.2 Distribution of Risks and Benefits

While the actual costs, risks and benefits may vary with the environment and even between members of the same community, it is universally accepted that these criteria have significance to the fundamental ethical values of equity, justice and fairness (Oughton 1996). The doses received by individuals due to the Fukushima Daiichi accident varied widely. The risks of exposure also varied with additional factors such as age, because children are deemed to be more vulnerable to the effects of ionizing radiation. Furthermore, the consideration of risks and benefits go beyond direct exposure and must include such aspects as the consequences of the radiation contamination on lifestyle for different members of the community. So for example, some lost their livelihood, while others were able to continue more or less as before the accident. Linked to the issue of consent discussed above, it has been suggested that the less-advantaged members of society often bear a disproportionate burden after accidents (Shrader-Frechette 2002, 2012). Examples after Fukushima include the situation for the elderly evacuees, and particularly those living in temporary housing who experience greater isolation from family and communities (NRA 2014).

The potential for increased health risks from radiation in children mean that the risk perceptions go beyond consideration for personal risks, as is seen by anxiety over thyroid cancer in Fukushima populations (UNSCEAR 2014; McCurry 2014). The fear that your child could be affected in the future can overshadow any personal concern (Bay and Oughton 2005). These concerns extend to pregnant women, as exemplified by the rise in voluntary abortions after Chernobyl (Knudsen 1991). This may seem irrational, since many other activities have a statistically greater probability of harming children, such as traffic or even other sources of exposure to radiation. The explanation is in part due to feelings of blame, guilt and responsibility, and questioning—have I really done enough to reduce the chance of my child being harmed? Even with strong epidemiological evidence to the contrary, if a child gets cancer or a baby is born with a disability, the parents will always wonder if this was due to the radiation exposure.
Justice has been discussed in this chapter as a biomedical principle (Table 3.1) and with reference to the distribution of risks and benefits, the challenges of discrimination and victimization and the need for the protection of the vulnerable in society. For the determination of whether there is distributive justice; the distributive norms of the group must be considered (e.g. group norms of equity, equality, need, responsibility). In this way the aim is the fair distribution of the benefits, risks and costs. The concept of distributive justice in social psychology can be defined as what is perceived as a fair sharing of costs and rewards to the members of the affected group. In the context of a radiological emergency the notion of distributive justice adds another layer of complexity in that some measures to reduce exposures could result in an equitable distribution of cost and exposure reduction, such as investment by taxpayers to the levels of radionuclides in public areas. On the other hand there are examples of less equitable measures, such as, when a reduction of exposure to the majority is only possible at the expense of a higher exposure, cost or welfare burden, on a minority (e.g., banning all farm production in a small community). This is exemplified in a case study on Norway reindeer herders (also see Figure 3.1).

**Case Study: Norway reindeer herders**

Norway was one of the European countries outside the USSR experiencing the largest radiological impact after the Chernobyl accident. High levels of deposition, especially in mountain and semi-natural areas, led to radiocesium concentrations in foodstuffs above those deemed acceptable for consumption. Many farmers had to endure monitoring and countermeasures to reduce levels in their produce. The lichen-reindeer food chain was particularly vulnerable, with more than 90% of reindeer meat in 1986/7 having Cs-137 concentrations much higher than the 600 Bq/kg limit at the time. In order to protect the minority reindeer herders, and on the grounds that the majority of the Norwegian population only ate reindeer rarely, the authorities raised the acceptable limit of Cs-137 in reindeer meat to 6000 Bq/kg. At the same time, limits were raised in freshwater fish, mushrooms and other semi-natural produce. The move had broad acceptance in the Norwegian public, and no discernible impact was seen on sales of reindeer meat.
3.2.3 Community Values and Societal Consequences

The Chernobyl and the Fukushima Daiichi accidents are both examples of incidents that resulted in a wide range of social and economic consequences. In Chernobyl many of the evacuees lost their jobs, social network, and connection to places of particular community or historical value like graveyards or places where they played as children (Bay and Oughton 2005). Resettlement and long term evacuation in Fukushima have changed the social structure of the villages and city districts. After Chernobyl, the Gomel region lost about 43 per cent of its population between 1986 and 2000, and demographic parameters, like mortality- and birth-rate have changed dramatically as elderly people in particular did not want to leave their villages, while young people did. The emigration of young people impeded the whole social and economic development of the region, including a shortage of teachers and doctors (UNDP 2002). Similar demographic changes have been seen after Fukushima, with young families more likely to evacuate and less likely to return. In some cases, this led to splitting of families with mother and children leaving and fathers remaining to work (NRA 2013; National Diet of Japan 2012). These lead in turn to a variety of social and health effects such as alcoholism, obesity and depression in affected populations (Yasumura, 2014; Yasumura et al., 2012).

The economic costs of accidents are complex and wide-reaching. However much one stresses the small physical risks, actual or potential radioactive contamination of food is one
of the fastest ways of losing consumer trust. This means that the economic and social impact of a radiation accident can be enormous, and overshadow the actual health risks. It might be easy to attribute this to yet another example of public irrationality, but people’s livelihoods and income depend on consumer choice. Stress, ill-health and even suicide can accompany job loss and bankruptcy. Loss of consumer trust can have profound consequences both for a range of industries (particularly food or tourist industries) and for the local identities of people and groups (Flynn et al. 2001; Bowley 2011). This has been well-documented in Fukushima with price drops for produce from the entire region, including areas not affected by the accident, as well as impacts on tourism (Consumer Affairs Agency Japan 2013). Negative economic side effects can arise from rural breakdown, and stigma of contaminated communities. Discrimination and stigmatization of the Hiroshima and Nagasaki hibakusha and their children has an important historical dimension in Japan (Hersey 1985), and is a particular concern for Fukushima evacuees. TEPCO workers also cited discrimination as one of the main causes of psychological stress (Shigemura et al. 2012).

The aftermath of an accident can also be economically beneficial to parts of the community, for example through generation of local employment opportunities. This may lead to some sections of the population making a profit from remediation (such as selling or hiring equipment), which can lead to further social inequity and division. As a parallel case, this was seen in the aftermath of the foot and mouth outbreak in the UK, when a minority of the affected communities made a large profit from the disaster (DEFRA 2002). Likewise, after hurricane Katrina, price increases in certain commodities led to outrage and calls for legislation to prevent such profit-making (Sandel 2010).

3.3 Risk Management

Doctors and public health workers can be expected to be confronted with a variety of views, perceptions and concerns associated with the public’s perceptions of risks following a disaster. Medical workers need to recognize that risk perception is complex and that many members of the public will have concerns that go beyond their personal risk of harm. Radiation risks are a particularly challenging type of risk. Three important lessons learnt from previous accidents will be discussed.

*Don’t assume that the public’s aversion to radiation is due to misunderstanding.* People will often turn to general practitioners and public health officials for information and advice, and being able to provide the correct information on the potential health risks is important.
Doctors need to be prepared to answer such questions from patients, the media and public advocacy groups. There is a tendency for experts to simply repeat the size of the health risks, compare them with lower background or higher medical exposure, and assume that any residual fear of radiation or remaining aversion to the risk is fuelled by phobia, irrationality, inappropriate thinking patterns and psychological problems of the patient (for a rebuttal of this view see Drottz-Sjöberg and Persson 1993). Many people would be concerned at the radiation exposure to their child from a CT scan, but be willing to accept the risk on the basis of the perceived benefit. However while communication can be aided by putting the risk into perspective with other risks, including other radiation exposures, explaining everything in terms of natural or medical exposures will not relieve all errors in risk perception. While not blaming irrational thinking for risk aversion it is also important to focus any intervention or mental health program on increasing rational thinking (Banks 2011).

Many people will be reassured by comparisons, but others are seeking different types of information. Communication therefore needs to be tailored to different needs and provided through different media and sources. Experts are good at telling what they know, but they should also try to be sensitive to what the public are actually asking.

*Recognize the importance of personal control and public participation.* Actions that can help people and communities gain control over their lives (i.e. information on actions that can be taken to reduce exposure) are an important part of coping with disaster (Dubreuil et al. 1999; Oughton et al. 2004; ICRP 2006). Choice, control, familiarity, closeness and numerous other social and psychological factors play an important role in shaping perceptions towards hazards. Measures that take these factors into consideration may stand a greater chance of success. So for example, centralized office and desktop assessment of exposures and risks should be supplemented by individual measurements and personal assessments for those people who request this type of information. Medical staff can play a role in gathering and interpreting data, and providing advice. Personal measurements can be an important stimulus to dialogue and communication between public and experts, and not only in the most affected areas. People may also need reassurance in areas that have been declared clean.
Realize that technical solutions are not enough on their own. Recognizing the enormous social and ethical consequences of a nuclear or chemical accident means that coping with that disaster needs to go beyond simple decontamination and reduction of the physical risks (Howard et al. 2004; Howard et al. 2005; Oughton et al. 2004; Oughton and Howard, 2012; Oughton, 2013). For nuclear accidents this will require a multidisciplinary approach where the technical, medical and radiation protection experts need to work with communication and social scientists (Howard et al, 2005; Oughton 2013). Also, actions need not be limited to those that reduce the exposure to radiation, and for example, for some, medical check-up and follow-up might help to relieve anxiety (Morrey and Allen 1996). Furthermore, psychological support and mental health should receive particular attention (Bromet 2014). The need for stakeholder engagement is recognized in all areas of risk assessment and management as an important mechanism of public empowerment (United Nations Economic Commission for Europe 2001). In practice, this would mean that discussions of coping with disaster should be extended to a wider group of stakeholders and experts, including medical professions, but

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**Case Study: Coping style, psychological distress, risk perception, and satisfaction in subjects attending genetic counselling for hereditary cancer** (Nordin et al. 2002)

“As a result of the recent developments in DNA testing and the knowledge that cancer can be hereditary, it is now possible to offer genetic counselling to people within identified “cancer families”, and to inform them about their assumed increased risk for developing cancer. One of the most important components in genetic counselling is the provision of information. Extensive research was performed on principles for providing patient information in a general medical setting. This type of information is usually fairly simple and concerns mainly the patient him/herself. In contrast, the information in genetic counselling is often highly complex, including risk estimates and aspects of heredity involving family members. … Theories of coping postulate that a person’s reaction to a stressful situation is moderated by his/her ability to handle the threat and the resulting reactions. An important aspect of the ability to cope with a potentially serious illness is the desire for information about its various facets. Some people, referred to as Monitors, have a tendency to search out information and focus on health threats, whereas others (Blunters) have a tendency to avoid information.”

See also: Rothemund et al. 2008; Young 1998
also consumer organizations, farmers, fishermen and so forth, many of whom have relevant technical and lay knowledge (Wynne 1989).

3.4 Conclusion

Public reaction to disasters is the result of complex and intrinsic features of risk perception, many of which have strong ethical and societal relevance. A holistic approach to disaster management should integrate economic, ecological, and health measures. Intervention strategies should be designed to accommodate the varied needs. For nuclear accidents, it is not sufficient to simply focus on the dose reduction aspects of radiation protection as societal aspects will play a major role in how individuals cope with and communities recover from the disaster. Engaging with the affected population with regard to increasing their understanding and personal control, and involving them in decision-making processes respects people’s fundamental right to shape their own future. In addition to increasing trust and compliance, such approaches can lead to significant improvements in the effectiveness and acceptability of disaster management in communities. This chapter should be incorporated into curriculum activities of medical students to facilitate them being receptive to mental health awareness with particular reference to coping with radiation and other types of emergencies.

Question and Answers

The learning objectives and terms from the glossary can be transformed into questions that can be used by the educator to stimulate discussion and further research by the students. There are also examples of the sort of questions that can be prepared in order to extend thinking and discussion on the topic. All these questions are examples of the sort of questions that can be set for class or small group discussions in order to achieve deep learning and understanding of the topic in this chapter. These questions (questions 2, 3, 4 and 5) can be given as part of an individual or group assignment that can be incorporated into the curriculum as a formative or summative assessment. Question 1 is an example of a different task to demonstrate that there are a variety of ways in which the educator can incorporate the chapter into learning activities that encourage student participation and increase engagement with the material and thereby enhance learning. The answers to these questions are not
intended to be complete or to provide a comprehensive outline of possible discussion. The intention is that the answers provide only a guide to the type of information that would be included in the discussion or written response.

(1) This is a group exercise. In a large class it is appropriate to divide the class into small groups of 6-8 students. This is not an exercise based on reality but because of the extreme situation presented it raises important messages about values and decision making. It is a good introductory exercise before discussion on radiation incidents and will usually capture attention and ensure students attend the classes. There can be variations on the theme and this is only one example.

NUCLEAR FALLOUT SHELTER EXERCISE

You are a member of an Ethics Committee that is trapped in a fallout shelter. The information you have is that it will not be safe for your group to leave the shelter for six months. There is adequate food, water, and other essentials to sustain the group for the required period.

In the shelter there is a telephone and one member of your group has spoken to someone in another shelter. The report is that there are nine people in the other shelter and that there are only enough provisions to keep four members of that group alive for the six months.

The other group has decided that five of its members will have to leave the shelter so that those remaining will have a chance to live. However, they have been unable to make the decision as to who will be put out of their shelter. The group has asked your Ethics Committee to make the decision and has agreed that your decision will be implemented without question.

The people in the other shelter are:

1. A male physician (General Practice), 72 years old.
2. A male scientist (medical research), 50 years old.
3. A male patient with mild depression, 48 years old.
4. A female attorney (criminal law), 40 years old.
5. An Imam, 40 years old.
6. A pregnant college student (business major), 28 years old.
7. A male carpenter (union), 25 years old.
8. A female college student (engineering major), 18 years old.
9. A female child, 6 years old.

The group task is to:
(Note that task 1 should be completed before tasks 2-4 are asked but all tasks are completed before feedback from each group is given to the class).

1. Reach consensus on a list of four people who will remain in the other shelter.
2. Provide at least 5 criteria that were used by the group to determine who would stay in the shelter.
3. State what issue you were trying to resolve.
4. Mention any assumptions the group made.

The answer to this exercise is not pre-determined. Most groups will do the exercise and provide the four people who will remain in the shelter. However there will be a variety of answers and all are ‘right’. There may also be groups that come up with something quite different and that makes for an interesting discussion. The class discussion can become quite heated and interesting as the groups argue for why their decision is the right one. At the end it is important to discuss values, the value of life and how culture impacts on what each individual values. It is also an opportunity to lead into ethical decision making and the use of tools in this process of reasoning and coming to the best possible answer for the circumstances. Question 2 addresses ethical decision making.

(2) Are models for ethical decision making helpful in a disaster situation?
Models for ethical decision making are used in health care and can be useful more broadly in disaster management. These models provide a framework for understanding expectations and responsibilities. There will be reasons for choosing a model or a combination of models. These reasons will include what is appropriate for the cultural, social and individual preferences as well as the specific circumstances. Models can be helpful to guide decision making as they provide a philosophical framework (e.g. covenant model based on agreement grounded in traditional values) and a problem solving approach (e.g. the DOWD model of steps in decision making). Although health care practitioners will at first need to follow a process quite rigidly
they will later develop an ethical problem-solving process that works for them. In a disaster there is no time to find a model and follow it. Therefore all health care practitioners should be trained to consciously think about ethical decision making and apply this. The use of scenarios and case studies is a useful way of allowing students the opportunity to work through various models.

The development of a disaster plan can in itself be an ethical decision making process. The steps might include something like; full assessment of the potential problem, identification of the many issues, analysis of the information gathered, preparation of an action plan for a given situation. This would be a good group exercise for students to engage in. They could then compare disaster plans they developed with the national disaster plan. The learning would be multi-faceted and the students are more likely to remember core elements of the disaster plan when they need it in the future.

(3) Why do different people make different estimates of the risk or the anticipated danger of radiation?

A complex problem in risk analysis and risk management is why individual and public concern can follow patterns that are not aligned to the expectations of the experts in the field. Some relatively minor risks can result in extreme concern that can have a major impact on mental health and even the economy. Risk perception in the context of ionizing radiation is a subjective judgment made by a person about the type of harm that radiation can cause and the severity of the risk in the given circumstances. The term ‘risk perception’ is often used in reference to nuclear power and following nuclear accidents and some of the societal and ethical factors impacting on the perception of risk were covered in this chapter. The risk perception of an individual will include threats to the environment but will mainly be focused on risks to their own health and the health of their family members (living, unborn and future generations). There are a number of theories regarding the reasons why people make different estimates of the risks and how dangerous they are. These theories include psychological, sociological, and multidisciplinary approaches that can all be explored by the students. One theory is the Social Amplification of Risk that is a conceptual framework that integrates the assessment of risk with cultural, psychological and sociological perspective of risk perception and behavior related to risk. The central aspect of this theory is that the public responses to the risks of the incident (for example radiation emergency) are amplified because of the interaction between the emergency and the social, institutional, community, psychological and cultural
processes. Communication of information is a critical component of this amplification and connections can be made to the chapter covering communication.

(4) How does the concept of autonomy and informed consent align with disaster management in different cultural contexts?
To answer this question there needs to be understanding of the construct ‘autonomy’ within disaster management in the specific environment. In some communities and cultures the medical community shifted from a situation in which the physician took on a parental role to their patient and their opinion was rarely questioned. As patients became more aware of their rights the health care practitioners changed their practice and took on a more ‘equal’ relationship with an emphasis on education, information and a collaborative decision making process that included the patient. This approach respects the definition of autonomy that no person should have authority or power over another person. In the medical interpretation, this translates into the situation that no patient will be treated without informed consent. Autonomy and informed consent profile the right of the individual and as such this fits the western culture of medical practice today. However some cultures honor a community or group value system in which the enforcement of individual informed consent is uncomfortable. The African value of ‘ubuntu’ is a philosophy that is not based on the individual. In this culture a person is a person because of other people and humanity is therefore not embedded entirely in the individual. In this situation, there is still the need for respect for the person but there may be the need to adjust the strict interpretation of autonomy and informed consent. The students could explore this and other examples of cultures that may be different to the western culture in terms of the application of autonomy and informed consent. Then also consider how informed consent varies in a disaster situation. Does the medical model of informed consent have to change in a disaster situation and when is the person’s right to information and informed consent for a procedure not possible or appropriate? These questions do not have a single right answer and this is therefore an opportunity for discussion and learning through listening to the views of others.

(5) What is important in the care of people affected by a nuclear or radiological emergency?
This question will draw directly on this and other chapters of this handbook but will also need to go beyond the confines of the information presented to include research and publications on the topic of care as relevant in emergency situations. In thinking about the societal and ethical dimensions raised in the chapter the student will understand the importance of reducing exposure in a radiation emergency but will also grasp the key message that this is not sufficient for the management of risk and harm in such a situation. The sort of information that might be included would be a discussion on: care and risk perception, physical health, mental health, the impact on families, care during and after evacuation, management of social and economic consequences of the nuclear or radiological emergencies, care of vulnerable groups (children, elderly, seriously ill, etc.), managing stigma, dealing with discrimination, radiation risks.

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**Further Reading**


CHAPTER 4
RISK COMMUNICATION

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Summary
This chapter consists of three parts. Part I describes the characteristics of radiation risk. First, we will explain “risk concept” in relation to probability, uncertainty, and the meaning of Risk Society. Then characteristics of radiation risk are explained using classifications by Solvic and that by Renn. The notion of evidence is also shown in the comparison with other risks in the epidemiological framework. In Part II, risk communication is analyzed in the “framing” analysis. First, we will contrast the deficit model and the two-way communication model in the research stream of science communication. Risk communication based on the deficit model and those based on the two-way communication model appear differently. Second, we will compare the role of information interpreter with information transmitter. Most scientists desire to perform an information transmitter role, whereas the public wants to have an information interpreter after the disaster; therefore, there is a discrepancy between what scientists think of as their responsibility and what the public thinks is the responsibility of scientists in risk communication. At the same time, we should pay attention to the difference between doctor-patient communication and doctor-public communication. Utilizing the results from social psychology and STS, we will show these differences especially for risk communication on radiation risk. Finally, in Part III, the effect of media, both traditional media and social media, in risk communication is discussed further.

Learning Objectives:
After reading this chapter the reader will be able to:

(1) Define risk
(2) Recall the characteristics of radiation risk
(3) Explain the deficit model and the two-way communication model
(4) Distinguish between an information transmitter and an information interpreter

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Differentiate between doctor-patient communication and doctor-public communication

Discuss the roles of media in risk communication

**Keywords:** Risk, deficit model, two-way communication model, doctor-patient communication and doctor-public communication, risk-communication

**Introduction**
Risk communication is highly important in disaster; however, there is a dichotomy between what experts and publics consider as the best form of communication. Using the STS concepts and research streams in science communication and social psychology, we will explain several useful concepts for medical experts to overcome the problems after disaster.

**4.1 Radiation Risk**

**4.1.1 Risk Concept**
What is “risk”? If you look up “risk” in the Longman Dictionary of Contemporary English (1987), you will find these items: (a) danger and (b) possibility that something harmful or undesirable may happen. Also you can find examples of sentences as follows: *Firemen wouldn’t allow anyone back into the building because there was a risk of the fire breaking out again.* / *Fishermen face a lot of risks in their daily life.* / *The disease is spreading, and all young children are at risk.* Therefore, the concept of risk is always related to a “possibility” or “likelihood”. Specifically, risk relates with “probability”, for example, the probability of an earthquake occurring, probability of occurrence of severe accidents, or probability of a dangerous dose.

When the concept of “probability” turns to the concept of “risk”, it refers to the need to protect something. For example, probability of dose turns to “risk” when we want to protect “health”. Agrichemicals turn to “risk” when we desire to protect “nature”. Therefore, human beings have had the concept of “risk” since they have had something that should be protected. Radiation risk is considered to become a risk since we want to protect our health.

Beck (1986) described in his famous book, “Risikogesellschaft” or “Risk Society” that we have to face a task on the “distribution of risk”, whereas sociology had been engaging the task on “distribution of welfare” before. He also pointed out the difference between scientific rationality and social rationality (p. 38), and stressed that the borderline by which the load is
endurable or not is determined not only by scientific rationality but also by social rationality. Therefore, in consideration of radiation risk, we have to think about social rationality.

### 4.1.2 Characteristics of Radiation Risk

In consideration of social rationality, we should think about the public perception of “risk.” In his famous paper, Slovic (1987) classified the risk perception of U.S. citizens as seen in Figure 4.1. As shown in this figure, radiation risk is located in the two different quadrants. The first, in quadrant I, is “unknown and uncontrollable”. Examples are radioactive waste and nuclear power plant accident. The other in quadrant II, is “unknown but controllable”. An example is X-ray.
Figure 4.1: Location of 81 hazards on factors 1 and 2 derived from the relationships among 18 risk characteristics (Slovic 1987).
Based on this classification, radiation risk is considered by the public as “unknown” and “uncontrollable” in relation to nuclear power plants accidents.

Another classification is by WBGU (2000) as quoted in Klinke and Renn (2006). Risk is classified using two axes: “Extent of damage” and “Probability of occurrence”. A nuclear power accident is classified as a “Damocles” type, whereby probability of occurrence is low, but the extent of damage is high.

These classifications reveal that the radiation risk is perceived as “uncontrollable” when it has a relationship with nuclear power plant accidents, which has low possibility and high damage. These are the characteristics of radiation risk.

4.1.3 Notion of Evidence

Then, for construction of social rationality on radiation risk, we accumulate evidence on health effects of radiation risk. ICRP Publication No.111 (2009) indicates as follows:
The reference level for the optimisation of protection of people living in contaminated areas should be selected in the lower part of the 1–20 mSv/year band recommended in Publication 103 (ICRP 2007) for the management of this category of exposure situations. Past experience has demonstrated that a typical value used for constraining the optimisation process in long-term post-accident situations is 1 mSv/year. [emphasis added by author]

What is “past experience”? The ICRP report (2009, 14) summarized past experiences with long-term contaminated areas resulting from either nuclear tests (Bikini, Maralinga), nuclear accidents (Kyshtym, Palomares, Chernobyl), or a radiological source accident (Goiânia). There is a presence of acknowledged uncertainty, and the scientific evidence cannot provide societal judgements about what is considered acceptable. The “experience” referred to is experience regarding the judgements that different societies have made in those circumstances.

In addition, we cannot perform experiments using human beings to gather evidence on the effect of radioactivity on human health. When we have to gather data from experiences instead of experiments, we cannot control the “cause” variables on the effect; for example, exposure level, exposed dose, and accuracy of exposure estimate. At the same time we cannot control the “effect” variables; for example, incidence of cancer and cancer death rates, both under consideration of spontaneous cancer, incidence of other disease, a decrease in math scores, and so on. Therefore, there are discrepancies between cause variables and effect variables when comparing with past experiences.

In summary, in the case of radiation risk we do not have clear “evidence” through experiments in which cause variables and effect variables are strictly controlled. We only have “past experiences” from which we can infer the effect of radioactivity on human health. We are still on the way gathering data.

4.2 Framing of Risk Communication

4.2.1 Communication Disaster

After 2011’s triple disaster—that is, earthquake, tsunami, and nuclear power plant accidents—Japanese society experienced a “communication disaster.” The National Diet Official Report of Fukushima Nuclear Accident Independent Investigation Commission (2012, 406-407) stated that there was a communication failure in protecting public health. It
also indicated that risk communication on radiation was not informative enough to residents. In the communication disaster, there was an information-deficit between citizens who wanted to know and professionals who were providing the information. Citizens wanted to know “impartial, non-partisan, wide-ranging information”, however, professionals wanted to provide “decisive action guidelines and limited, absolute information”. The Science Council of Japan insisted on “unique” or “unified” knowledge while the Japanese government and professionals were hung up on “unique, decisive action guidelines”, and they disclosed only “safety” information. Consequently, Japanese citizens began to develop distrust towards the government and professionals. There were also differences in anxiety with regard to information. Citizens (or residents) had anxiety related to the limited information and anxieties of distrust towards authorities. On the contrary, professionals had anxiety related to the non-unique voice and public unrest.

One of the reasons why these gaps arise is the different models by which professionals and citizens base themselves. Professionals and the government have a “one-way communication model”, which shows that there is plenty of knowledge for specialists, whereas citizens are ignorant. Knowledge is therefore conveyed from specialists to public: that is, one-way. Therefore, professionals desire to provide “decisive action guidelines and unique information” to the ignorant public. On the contrary, there is another model: two-way communication model. It recognizes that publics or residents have their local knowledge, so specialists convey scientific knowledge and publics convey local knowledge to the specialists. If we adopt this two-way communication model, publics wish to receive “impartial, non-partisan, wide-ranging information”, and want to decide the next action by themselves based on this information. ICRP reports also insist on the importance of involvement of habitants. That includes two-way communication.

In dealing with a communication disaster, there is another model known as a double interpreter (Sakura et al. 2013). Sakura and their colleagues conducted interview surveys and showed that there is a need for a two-interpreter system, i.e. a local interpreter and a specialist interpreter. Local interpreters can be high school teachers or public health professionals and they describe the situation to local residents. In addition, there are specialist interpreters who communicate expert knowledge. He asserts that the communication between local interpreter and specialist interpreter is important. This form of two-way communication resembles the two-way communication between specialists and public.
4.2.2 Information Interpreter and Information Transmitter

To specify the requirements for specialists by public under communication disaster, one of the important notions is the difference between information transmitter and information interpreter. In this “communication gap” between scientists and citizens, scientists and medical professionals tried to convey “right information”, and to be good “information transmitters” and they think that to be a good transmitter is one of the responsibilities of scientists. On the contrary, the public needs an “information interpreter” and they asked scientists, “What would you do if you were me”?

On this point, Prof. Fassert, a researcher at IRSN (Institut de Radioprotection et de Sûreté Nucléaire) had written a report in 2013 stating that “being an expert during a crisis is much more than delivering information”. This means that the public requires not only an information transmitter, but also an information interpreter. It is a very difficult question to ask whether being an “information interpreter” is a responsibility of scientists or not. There are huge gaps between what scientists believe is their responsibility and what the public thinks is scientists’ responsibility. Since medical doctors and scientists have only been educated as “information transmitters”, they face many problems in risk communication.

4.2.3 Difference between Doctor-Patient Communication and Doctor-Public Communication

In this section, the concept of “information interpreter” is considered further focusing on the difference between doctor-patient communication and doctor-public communication. For example, doctors and patients share a higher goal. That is, to battle with disease, and to raise the quality of life. When they share the higher goal, then they can “trust” each other. Therefore, due to the higher goal they share with their patients, doctors can be good information interpreters.

Based on this model, we can raise the next question: How does doctor-public communication differ from doctor-patient communication? To answer this question, the key point is the difference between the higher goals. As noted above, in doctor-patient communication, they share higher goals. On the contrary, in doctor-public communication there are many higher goals. For example: to ease public’s worry, to collect scientific data, to open neutral data, or to abolish nuclear power. These higher goals are not all necessarily shared between doctors and publics. Since interpretation differs when doctors and publics have different higher goals,
doctors cannot be good information interpreters. In some cases, they are referred to as information distorters.

To summarize, when doctors and patients share a higher goal, doctors are found to be good information interpreters based on feelings of “trust”. On the contrary, where they do not share the higher goal, doctors cannot be good information interpreters, and distrust arises.

The “higher goal model” in information interpretation can be linked to “social trust.” It can explain segregation in Japanese society. First, we will explain SVS (Salient value similarity) model in social psychology. In social psychology, it is said that there are two components in constructing “social trust.” One is competence, and the other is fairness in motivation. Competence means ability, experience, and qualification. Fairness in motivation means impartiality, integrity, and honesty in motivation of research. The theory is that if a person with competence does something with fair motivation then others will trust him/her. However, after 3.11, statements by persons with both competence and fair motivation had have instead generated mistrust. Why? SVS model will explain these situations better.

SVS model postulates that shared values determine social trust in institutions and persons related to a technology. In this model, if one thinks that the person in front of them shares similar salient values with him/her, then he/she will trust that person. One has trust in people holding similar salient value. The “salient values” resemble “higher goals” in the previously mentioned concept. At the same time, when doctors and patients share “salient values”, doctors can be good information interpreters based on their “trust”.

To summarize, one has trust in people with competence, with fair motivation, and who hold similar salient values. Therefore, one who holds salient values to ease the public’s worry has trust in other people holding salient values to ease the public’s worry. One who holds salient values to open neutral data has trust in people holding salient values to open neutral data. In addition, one who holds salient values to abolish nuclear power has trust in people holding salient values to abolish nuclear power. In this way, one has trust in people holding similar salient values, and this tendency accelerates the segregation of groups which have different salient values.

This salient value model can better explain the difficulties in doctor-public communication compared with those in doctor-patient communication. When doctors and patients share the higher goal or salient values, for example, to battle with disease, and to raise the quality of
life, then doctors can attain trust and can be good information interpreters based on their “trust”. On the contrary, in doctor-public communication, doctors rarely share the same higher goal or salient values as there are a variety of higher goals and different salient values. This leads to difficulties of trust between doctors and publics. Doctors will have troubles with publics, especially with groups who have different salient values, and groups who cannot share salient values with doctors.

Currently there is a high demand for doctors to deal with this communication disaster. Doctors have learned medical science, and learned communication with patients, but they have not learned communication with the public. In the construction of different salient values, the media will play an important role in bridging this divide. We deal with the roles of media in the next section.

4.3 The Roles of Media on Risk Communication

The media (also known as mass media) – including radio, television, newspapers, magazines, and the Internet – is the largest source of information in society today. Many of us form our general opinions about health, environment, food and safety by what we read online or by watching TV news. In communicating risk-related information, health professionals (and others) often have to deal with the media as the key information provider, or channel of information.

Media can be defined as any channel (broadcast media, namely TV & radio; print media, outdoor media e.g. billboards; new media e.g. Internet & text messages; social media e.g. Facebook, Twitter, YouTube, etc.) that is used to communicate or transmit information. Media is now no longer used in one-way communication but is interactive involving multiple stakeholders.

Scientists and doctors can present their research and innovation in conferences but to a large extent their messages that reach the public are channeled or mediated by traditional media as well as social media. Media often plays a central role in public health campaigns. Such campaigns are aimed to promote long-term changes in life-style, attitudes, behaviors and knowledge. For example, some encourage people to stop smoking, exercise regularly, wear seatbelts, reduce risk of AIDS, and handle raw food safely.

There have been many studies on understanding how media coverage influences public perception of risk issues. We want to know the extent to which news coverage affects public
opinion but also how the particular contents of news messages affect this opinion. However, such studies are very difficult to carry out.

The Internet has given birth to social media that is becoming a valuable tool for risk communication. It not only provides instantaneous distribution channels to a wider audience but it also gives organizations almost instant feedback as to what people are thinking about the risks and the concerns that they are sharing. It allows the organizations to respond quickly according to rapidly changing scenarios. In this respect, social media has certain advantages over traditional media. Social media can offer a platform for representatives or experts from regulatory bodies and international agencies to come forward and make their messages more personalized through the use of social utilities like Facebook, Twitter, and especially YouTube where the messenger can be seen clearly. Kaplan’s and Haenlein’s (2010) definition of social media as a means of allowing “the creation and exchange of User Generated Content” illustrates the potential of using social media as an important means for producing and trading information on a large scale.

The proliferation and ubiquity of social media communication channels have made it easier for most people to seek and find information on almost any health related topic, and the information that they obtain from the search is often diverse and divergent in perspectives. As a result, people have an increasingly difficult time judging the accuracy and credibility of information coming from ‘experts’ and are turning instead to peers and ‘friends’ through online social networks to inform their health-related decision making. Thus we must be very cautious regarding the authenticity of the information provided by social media sites, as most of them do not have proper quality control and the source of information is questionable.

During the 2009 H1N1 influenza pandemic, the US Centers for Disease Control and Prevention (CDC) harnessed the potential of social media to provide health and risk information to consumers (Bernhardt 2010). The CDC employed many social media tools such as weekly tips by email, text messages by Widget, e-cards, mobile phones, RSS (Rich Site Summary, also known as Really Simple Syndication), Twitter, Facebook, WordPress, a blog, Flickr, and YouTube to disseminate information to the general public.

Social media has also been deployed during the Fukushima Daiichi accident to communicate risk-related issues to varying degrees of success. The Fukushima nuclear accident is a global issue, and given its characteristics of complexity, uncertainty, and ambiguity, risk communication should be improved. This will be accomplished by conveying complex
subject matter, such as radiation and its effect on human beings, in language that laypeople can understand. At the same time, support of the international agencies and organizations to use plain and consistent language wherever possible would be particularly useful. Indeed, this is a lesson from which health authorities all over the world should learn (Ng and Lean 2012). From this and other experiences, we have learned that social media could help in “(i) increasing the dissemination and potential impact of rapid public communications in incidents involving life threatening illnesses, acts of terrorism, or other potentially major threats to public health; (ii) use emerging channels of communication to reach diverse audiences with tailored and personalized health messages; (iii) facilitate interactive communication and community engagement; and (iv) empower people to make healthier and safer decisions in protecting public health” (Nall 2010).

There is a need to improve public information especially in the event of a crisis and the call for educational efforts and action to improve risk communication. We should consider seriously incorporating social media (in addition to traditional media) as an important tool in risk communication. Additionally, research should be carried out to evaluate the extent of the effectiveness of the use of social media in risk communication and risk management.

4.4 Conclusion

In this chapter, we have learned about the concept of “risk.” When the concept of “probability” turns into the concept of “risk”, we now understand that something should be protected; for example, health or nature. The primary characteristic of radiation risk is “uncontrollability”.

In addition, one-way communication model assumes that there is plenty of knowledge for specialists, and citizens are ignorant. Knowledge is conveyed from specialists to the public, that is, one-way. Experts explain this model of communication as the “deficit model”: the public is deficient in scientific knowledge whereas scientists are knowledgeable. Therefore, professionals desire to provide “decisive action guidelines and unique information” to the ignorant public. On the contrary, there is another model: the two-way communication model. It shows that publics or residents possess local knowledge, so specialists ideally convey scientific knowledge and publics convey local knowledge to the specialists. If we adopt this two-way communication model, publics want to receive “impartial, non-partisan, wide-ranging information”, and want to decide the next action by themselves based on this information.
We also learned the difference between information transmitter and information interpreter. Whereas doctor-patient communication is sufficient for good information interpreting, since they often share higher goals or salient values, doctor-public communication is much more difficult since they cannot share higher goals or salient values. In the construction of higher goals and salient values, the media plays a very important role.

Questions and Answers

(1) **What is risk?**

Risk means the possibility that something harmful or undesirable may happen. The concept of risk is always related to a “possibility” or “likelihood” that something bad may happen to protect our environment or our health.

(2) **What are the characteristics of radiation risk?**

Radiation risk is perceived as “uncontrollable” when it has a relationship with nuclear power plant accidents, which has low possibility and high damage. These are the characteristics of radiation risk.

(3) **What is the deficit model and the two-way communication model?**

Deficit model shows that there is plenty of knowledge for specialists, whereas citizens are ignorant. Knowledge is therefore conveyed from specialists to public. On the contrary, two-way communication model recognizes that publics or residents have their local knowledge, so specialists convey scientific knowledge and publics convey local knowledge to the specialists.

(4) **What is the difference between doctor-patient communication and doctor-public communication?**

In the case of doctor-patient communication, they can share the higher goal or salient values, for example, to battle with disease, and to raise the quality of life, therefore, they can build trust with each other. On the contrary, in doctor-public communication, doctors rarely share the same higher goal or salient values as there are a variety of higher goals and different salient values. This leads to difficulties of trust between doctors and publics.
What are the roles of media in risk communication?

The role of media on risk communication is a rapid dissemination of information related to public health and the media influences public perception of risk issues. It promotes interactive communication with stakeholders and personalized health messages. The media can engage with public and empower them.

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CHAPTER 5

SOCIAL DETERMINANTS OF HEALTH

Laurence Monnais19,20

Summary

The social determinants of health (SDH) perspective is based on a disparate public health and social science literature and grounded in the ‘McKeown thesis’ (1976) which suggests that the most important antecedents of human health status are not medical care inputs. Instead they are social, economic and cultural characteristics of individuals and groups (Evans, Barer and Marmor 1994).

There is no definitive list of SDH; they range from racism to poverty, from lack of education to living in a violent neighborhood. Health systems are a SDH when access to efficient public-funded and ‘culturally accessible’ care is an issue. In 2005, the WHO established the Commission on Social Determinants of Health on the premise that action on SDH is the most effective way to improve global health and promote social justice, thus reasserting the 1978 Alma-Ata ‘health for all’ motto and ‘modernizing’ 19th century social medicine movements. In a context of disaster, SDH must be taken into account when it comes to medical intervention since some of these determinants might have an important incidence on the survivors’ physical and psychological well-being and since the vulnerability of specific groups might increase (in relation to edible food scarcity, destruction of domestic spaces, relocalisation of refugees, and stigmatization of the victims). Sanitary crises are always and everywhere socially disruptive. SDH also vary in time and space: although Japan has the highest life expectancy in the world, from a SDH perspective gender inequities and the weight of a patriarchal society have consequences on local health disparities (Lock 1994). Recalling the SDH actions taken in different historical contexts of crisis and identifying specific Japanese SDH will help medical students address future disasters in the country.

Learning Objectives

After reading this chapter the reader will be able to:

(1) Explain a SDH and describe the use of a SDH approach

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(2) Apply the SDH approach to medical intervention in situations of crisis
(3) Identify specific SDH in a given/local situation
(4) Discuss the use of a SDH approach in disaster zones or situations of crisis
(5) Mobilise tools to develop a SDH approach in a disaster context that is sensitive to local realities

**Keywords:** Social medicine, social justice, social determinants of health, ecological approach

**Introduction**

The social determinants of health (SDH) approach is one based on a disparate public health and social science literature that suggests that the most important antecedents of human health status are not necessarily medical care inputs. It is an ecological approach to human health. In situations of crisis, SDH must be taken into account when it comes to medical intervention as some of these determinants may have an important impact on survivors’ physical and psychological well-being and on society as a whole. Recalling SDH actions taken in different crises and identifying, more specifically, Japanese SDH (social capital in particular) will help medical students address future disasters in the country.

**5.1 Using SDH approaches for human health**

The current SDH perspective is grounded in the ‘McKeown thesis’ (1976). The historian McKeown postulated that the improvement of human health from the 18th century onwards was due to economic growth, rising living standards, and improved nutrition. In the wake of his seminal work, health policy specialists Robert Evans, Morris Barer, and Theodore Marmor (1994) emphasized the role that social, economic, and cultural characteristics of individuals and groups played in the betterment of health. In March 2005, the World Health Organization (WHO) established the Commission on Social Determinants of Health (CSDH) on the premise that action on SDH is the most effective way to improve global health and promote social justice; it aimed to draw the attention of governments to SDH as well as promote the creation of better social conditions for health, particularly among the planet’s most vulnerable people. The commission delivered its report to the WHO in July 2008 before ending its functions. The CSDH made three recommendations: improve daily living conditions; tackle the inequitab distribution of money, power, and resources; measure and understand the problem and assess the impact of action. These recommendations led to the endorsement by WHO member states of the Rio Political Declaration on SDH (WHO 2011).
However, perceiving SDH as fundamental in tackling health care issues is hardly novel. By the second half of the 19th century social medicine movements were participating in the formation of public health discourses and actions. This was reflected in an increased awareness of the powerful relationship between a person’s social status, their living conditions, and their health outcomes. In Japan, advances made by statesman Goto Shinpei’s (1857-1929) in public health, precluded the maturation of social medicine (shakai igaku) during the Interwar period thanks to the work and advocacy of some Japanese doctors including Sato Sho, Mizobuchi Tadao, and Komiya Yoshitaka who hoped to better fight TB (Johnston 1995, 252-65). Public health tends to consider a specific population as a sum of individuals (characteristics such as sex, age, education, income and ethnicity permit the classification of these individuals into groups); in contrast, work in social medicine envisions populations, as well as social institutions, as totalities whose characteristics transcend those of individuals. Social medicine therefore defines problems and seeks solutions with a social unit of analysis rather than an individual one. Social medicine also conceptualizes the duality of ‘health-illness’ as a dialectic process rather than a dichotomous category (Waitzkin et al. 2001, 1593-94).

Epidemiological research has since confirmed the centrality of social factors in the impressive improvement to the health of populations in industrialized countries. The development, in the context of the Cold War and decolonization, of scientific medicine and its therapeutic breakthroughs (vaccines and antibiotics in particular) put greater emphasis than before on health technologies delivered through ‘vertical programs’. This was especially true after 1945 despite the fact that the failure of the WHO’s campaign for the global eradication of malaria would soon lead to the rise of community-based approaches. Such initiatives emphasized community empowerment and the role of civil society, defined as the “organized non-state, non-market sector that exists above the family and individual” (Kawato, Pekkanen and Tsujinaka 2012, 78) in health decision-making as well as linking—once again—health to political, economic, social, and environmental demands. It was thought that locally recruited health workers might be well positioned to assist their neighbors in confronting a majority of health issues; health education and disease prevention were at the heart of these strategies (Irwin and Scali 2007, 238). These initiatives shaped a new WHO strategy better known as the 1978 Alma-Ata ‘health for all by the year 2000’ declaration. The new primary health care model it presented was not only creating a new fundamental level of care within a given health system (putting the emphasis on the basic health needs of the majority); it was also a philosophy of health work as a part of the ‘overall social and economic development of the community’ (WHO and UNICEF 1978). This approach was to be applied mostly to developing countries, since the collapse of welfare systems in developing countries at a time of increased neo-liberalism and free market capitalism led to a wider rethinking about the impact of socioeconomic inequities on population health.

In some cases neoliberal thinkers were able to turn emerging findings on SDH to their own advantage by framing non-medical influences on health in terms of individual ‘lifestyle choices’. The influential 1974 report issued by Canadian Health Minister Marc Lalonde lent itself to such a reading. Lalonde’s emphasis on the effects of environmental and behavioral factors on health provided ammunition to ideologies promoting ‘personal responsibility’ (Lalonde 1974).
Health experts have since asserted that a SDH approach to health cannot be separated from well-designed public health interventions, health care professionals, and their relationship with national policies, ideologies, institutions, and, more broadly, social change (Szreter 2002, 724). Moreover a SDH perspective is an ecological one that emphasizes both individual and contextual systems and the interdependent relationship between the two in regards to health. However, the relative importance of investments in health care vs. investments in other determinants of health remains up for debate.

It is important to note that although Japan has the highest life expectancy in the world, its health expenditure is only 8.5% of GDP, which places it in 20th position in terms of expenditure among Organisation for Economic Co-operation and Development (OECD) countries.

5.2 Identifying specific SDH in a given/local situation

What’s more, there is no definitive list of SDH. These can range from racism and gender inequality to poverty, from lack of education to living in a violent or polluted neighborhood; by contrast, living in a democratic country where economic disparities are low and social capital high (both at the structural level: resources embedded in social networks and social structure and at the cognitive level; trust and reciprocity in actions within the structure and networks or social cohesion: Putnam 2000) is considered good for your health. However, health systems become a SDH when access to efficient public-funded and ‘culturally accessible’ care is an issue. SDH is thus a flexible and multilayered concept. For instance, several studies have recently shown that cognitive social capital has an impact on health in Japan both positively (trust and mutual aid promote longevity) and negatively (enforce conformity and intolerance for diversity, within the context of the Japanese school system for instance) especially on a local scale (Takao 2009, 509-511). The relative ranking of multiple SDH is also hard to establish. One of the reasons has to do with the fact that SDH vary across time and space. Therefore, when a local study of SDH is conducted, it had to be done in relation to a given “political, socioeconomic, cultural, geographic and historical context” (Cook, Bhattacharya and Hardy 2009). Locality matters on many different levels: macro and micro contexts intertwine, as do history and geography, further reinforcing the complexity of SDH mapping.
5.3 Using an SDH approach in disaster zones or situations of crisis

Disasters, natural or otherwise, notwithstanding social organization or geographic location, remain disruptive; they affect the physical health (injuries, contamination, worsening of previous pathologies) and psychological well-being (PTSD, major depression disorders, generalized anxiety disorders, and panic disorders (Norris et al. 2002) and cause increased rates of substance abuse, violence and suicide (Otani 2010, 73) in individuals of affected communities. They also tend to affect specific sub-groups more acutely, notably previously vulnerable populations (the elderly, youth, women, ethnic minorities, or poor people). Thus a country that had not already addressed SDH such as poverty, unemployment, housing, transportation, nutrition, and social support will likely be more affected by a disaster (Johnson and Stoskopf 2010). A ‘social autopsy’ of disasters would improve further disaster recovery interventions (Klinenberg 1999), as well as reveal what had previously been hidden by the daily functioning of a given community (Otani 2010).
A SDH approach is also fundamental when it comes to dealing with the disaster itself and its outcomes. In fact, the vulnerability of specific groups might also increase in the aftermath of the crisis due to edible food scarcity, pollution, destruction of domestic spaces, re-localization of refugees, unemployment, economic instability and new forms of competition for resources, stigmatization of the survivors—in the case of Chernobyl or Minamata survivors for instance—and loss of social support. These local vulnerabilities could potentially lead to increased health discrepancies in the long run, as well as to new health issues.

Japan has overcome huge disasters in the past; a number of serious sanitary crises involving natural and nuclear disasters, environmental pollution (Minamata, 1956-), food-borne diseases (such as the Morinaga Milk co. arsenic poisoning, 1955) and health hazards due to pharmaceuticals (Yakugai) have occurred since World War II. Earthquakes in particular are historical objects of knowledge-making in Japan, restructuring disciplines, institutions, and even individual careers (Clancey 2006, 5). The Japanese have learnt from their past experiences and, in this regard, they have developed a ‘catastrophe cultural memory’ (Duus 2012, 175), even a ‘catastrophe collective resilience’ (Kingston 2012, 2) that participated in the forging of the nation. After the Kobe earthquake of 1995, which was soon christened ‘year one of the volunteer age’ (borantia gannen), the Japanese quickly learned to rely more on overseas assistance and local civil society, a fact demonstrated in the initial response to the humanitarian crisis in Tohoku (Avenell 2012, 53-55). Also ‘Kokoro-no-care’, a concept encompassing mental health care and psycho-social support, has become a watchword for helping post-disaster communities recover, thanks to the results of longitudinal surveys that have shown increased social problems (alcohol dependency, nutrition and diet issues) in the aftermath of the earthquake (Otani 2012, 247). Still, approaches to reconstruction remain mainly top-down. This can be explained by the weight of history, as can some reactions to the Chernobyl catastrophe in historically ‘brutalized Ukraine’ (Petryna 2003). Since the early Meiji period (1868-1912), Japan’s
development has been achieved via top-down programs of purposeful accelerated socio-political modernization and economic expansion. This required the development of a set of institutions that could execute the government’s vision through a coordinated mobilization of the nation’s resources and people. In the post-war era, the ‘iron triangle’ of political, bureaucratic, and corporate elites became institutionalized: the nuclear industry (what some call the ‘nuclear village’), TEPCO in particular, symbolizes this co-dependent network of relations (Matanle 2011, 838-41).

When the Minamata disaster occurred in the 1950s, industrialization had priority over public health in Japan. Private companies demonstrated a lack of ethics and failed to manage the disclosure of information to the public, worsening the management and recovery of the survivors. Imamura, Ide and Yasunaga (2007)’s study shows that insufficient social recognition of environmental pollution, inadequate inspections and faulty diagnoses (the disease was initially called an endemic disease of unknown cause) together contributed to delays in the identification of the real cause of the illness, resulting in continuing damage. In this particular case, long-term effects on human health were not considered, and insufficient help was deployed to both sick and unaffected citizens of Minamata.

We can certainly learn from the past but Fukushima Daiichi accident is no Kobe redux; there is no way to prepare for every contingency and a disaster is always a surprise to some extent. The Fukushima Daiichi accident has drawn attention to enduring institutional problems, notably the fact that the agency supposed to act as the nuclear watchdog is part of the ministry responsible for promoting nuclear energy, as well as a generalized low level of trust in governmental institutions (Hommerich 2012). The weakness of civil society advocacy organizations may also have been a contributing factor in the nuclear accident since they were largely ineffective in their monitoring of government policies and industry excesses (Avenell 2012, 79). The nuclear meltdown also exposed the fragility and contradictions in Japan’s energy policy, potentially leading to greater internal scrutiny of Japan’s economic development model (Matanle 2011, 837) in the post 1997 era. The Fukushima Daiichi accident is a critical event that is embedded in what historian Peter Duus (2012, 178) calls Japan’s ‘lost decades’. This concept is expressed by a country facing fundamental questions as it witnesses economic stagnation, a demographic problem of herculean proportions, the collapse of the social welfare system, and growing inequality. By contrast, the huge impact of social media both positive—on the reinforcement of civil society’s role through Social Networking Services—and negative—leading to possible more cases of PTSD because of shinsai hai or ‘disaster high’ (Slater, Nishimura and Kindstrand 2012, 103)—could not be foreseen. Moreover, the Fukushima Daiichi accident was a ‘compounded catastrophe’ that occurred in a ‘shrinking region’ (Matanle 2011); it occurred in rural, even remote areas with a high proportion of elderly people (an estimated 30% or more of the population in the tsunami affected areas was over 65 years old) where the economic situation had been in an almost constant state of degradation since the 1950s. In terms of per capita GDP, Miyago ranks 32 out of Japan’s 47 prefectures with Iwate ranking 39 (Curtis 2012, 21). These
are several reasons why a SDH approach to medical intervention in the aftermath of a catastrophe is fundamental to improving both individual lives and helping communities recover.

**5.4 Importance of SDH approach in medical interventions**

But what do these specificities and realities concretely mean for clinicians who participate in the recovery of the Tohoku region and who will eventually intervene in further disaster recovery missions? Firstly, it means following an ecological approach when evaluating a given situation, taking both global (political, economic, social) and local realities into account, as well as the relationship between the local and the global. For instance, in the case of Fukushima and its surrounding area, this would concretely mean to take into account the fact that local farm products and fisheries were very quickly stigmatized due to fears surrounding radiation, which only reinforced the risk of having the local economy collapse, with potential repercussions on the country’s economy as a whole. In the case of the broader Tohoku region, this would also mean acknowledging the fact that the region is a historically ‘silent’ one, perhaps even stigmatized (Morris 2012, 42). Thus, identifying and monitoring the local vulnerabilities and social problems that existed before the disaster is crucial. Secondly, clinicians would have to nurture and reinforce social capital. What’s more, we must give particular attention to reinforcing social capital when such a destructive and disruptive disaster occurs in a region where social and economic vitality has been weakened in the past decades (Kingston 2012, 5). For instance, re-localizing elderly people is not a simple matter; it threatens to reinforce pre-existing vulnerabilities related to age and to the local erosion of traditional family living arrangements (Otani 2010, 237-42). Therefore, there is a need to engage as quickly as possible with local community leaders and organizations, with local Neighborhood Associations (NHAs), associations that generate social capital and whose importance is particularly salient in rural areas and in efforts to improve disaster preparedness and response (Avenell 2012, 83-84). Relying on local associations’ knowledge regarding local needs—what some social scientists call learning ‘from below’—could help mitigate isolation and anxiety in order to avoid *kodokushi* of elderly people as it occurred on a quite disturbing scale after the Kobe Earthquake (Curtis 2012, 21). Instead, one could promote, with the help of such associations, locally-adapted reconstruction, in terms of housing, but also in helping forge a new community with a potential for future economic development. Clinicians could also participate in increasing survivors’ empowerment by helping them develop a strong voice in public debates (Holtz et al. 2006). Bedside manner should thus be extended to an informed ‘community-side manner’ that considers all social factors contributing to human health. Thirdly, this ecological intervention, sensitive to local specificities and issues, requires interdisciplinary research (on the long term, before and after disasters) and interdisciplinary action that takes into account work that has been accomplished in social sciences and in ethnography such as the works I have quoted in this chapter, as
well as works that concentrate on previous Japanese disasters and foreign ones such as Katrina or Chernobyl. From a SDH perspective, both epidemiological statistics and personal experiences collected through (medical) interviews with survivors (i.e. both quantitative and qualitative data) are fundamental; personal narratives and clinical facts matter equally especially when pre-disaster socioeconomic vulnerabilities are salient.

5.5 Conclusion

Interaction with survivors needs to be a continual process, as is giving them a platform to speak about their identities and give an ‘unsterilized’ version of what they perceived happened. This includes sharing their own physical and psychological experience of the catastrophe. Asking for their own interpretation of the(ir) future matters as well since such a disaster might have an impact on the whole of Japanese society, generating unnecessary anxieties regarding the future of a country, its economic growth, and its political and social stability.

Questions and Answers

(1) What is a SDH?

A SDH is a social, economic, cultural, and/or historical factor which is recognized to be a determinant in the improvement or deterioration of human health.

(2) What does using a SDH approach mean?

Using a SDH approach means to use an ecological approach to health that involves paying attention to a wide and locally specific range of socio-cultural and historical realities and economic disparities.

(3) Why is having a SDH approach important when it comes to medical intervention in situations of crisis?

Having a SDH approach is important when it comes to medical intervention in situations of crisis since:

i. This kind of situation is socially disruptive;

ii. These determinants might have an important incidence on the survivors’ physical and psychological well-being; and

iii. The vulnerability of specific groups might increase.
(4) How does one identify specific SDH in a given situation?
Identifying specific SDH in a given situation implies paying attention to both collective and individual local needs in terms of health and well-being and working closely with local community leaders and organizations.

(5) How does one use a SDH approach in disaster zones or situations of crisis?
Using a SDH approach in disaster zones implies interactions with the survivors and producing qualitative studies regarding their own experience, anxieties, and expectations for their own future.

References


Further reading


CHAPTER 6
PROFESSIONALISM, LAW AND ETHICS

Tamra Lysaght\textsuperscript{21} and Satoshi Kodama\textsuperscript{22}

Summary

Major disasters are public emergencies that tend to demand significant medical resources and expertise. These demands may be greatest in situations where medical professionals are unable to access their workplace, which may result in hospital facilities being understaffed and unable to cope with the influx of patients requiring assistance. While physicians who work outside the affected area may wish to offer their assistance, the lack of reliable information and uncertainty that often follows a disaster can make it difficult to assess whether it is safe enough to enter an affected area to provide medical assistance. These challenges are compounded when the immediate risks are unknown but the need for medical care may be critical. In this chapter, we discuss the legal and moral obligations of physicians to provide medical care to patients affected by disasters; both for doctors who live in or near the affected areas, and for those who live away from the disaster zone.

Learning Objectives

After reading this chapter the reader will be able to:

(1) Describe the legal and moral duties of a doctor who works in or near the disaster zone, in relation to his/her patients and others in need of help in public emergencies

(2) Discuss the legal and moral duties of a doctor who works away from the disaster zone, in relation to those in need of medical help in public emergencies

(3) Apply ethical reasoning to decisions on whether doctors should provide medical assistance in a public emergency

Keywords: Medical law and ethics, duty to treat, professional codes of conduct, virtue ethics

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Introduction

Public emergencies are typically characterized by the pressing need for medical assistance and doctors working in or near an affected area may be called upon to care for injured people. Physicians with specialist training may be required to diagnose and treat disaster-related injuries. In addition, patients with unrelated illnesses and conditions may still be in need of medical attention and physicians may have existing fiduciary duties to care for them. Thus, physicians may be legally and ethically required to remain in or around disaster zones despite the risks of harm to themselves. To help physicians understand these duties, this chapter will consider two scenarios: 1) where a physician works in or near a disaster zone, 2) where a physician works away from the disaster zone.

See relevant laws and guidelines, local reports

- Medical Practitioners Act (1948, as amended 2008)
- News report about the shortage of staff at Fukushima hospitals http://www.youtube.com/watch?v=6h6OXqch3O8

Before discussing the legal and ethical obligations of physicians in public emergencies, it is important to make clear some of the differences between the law and ethics. In many ways, the law and ethics require the same kind of conduct from individuals, such as not harming others and respecting the privacy of others. However, there are different expectations for individual conduct.

First, the law expects us to behave toward others in a way that is reasonable, while ethics demands a higher standard of acting for the good of others. For example, while we might agree that doctors should show compassion to their patients, we might also accept that it is not reasonable to require a doctor to do so in all circumstances – that expectation is better left as a moral ideal or aspiration. Second, the law enforces its rules by means of sanctions, such as fines and imprisonment, whereas ethics has either one’s conscience or social influences, such as praise and criticism from others, to guide behavior. So, for example, a doctor who

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23 This explanation has been sourced from the Health Ethics, Law and Professionalism (HeLP*) Phase I Course Book 2013 – 2014. MBBS Programme of the Yong Loo Lin School of Medicine, National University of Singapore. Centre for Biomedical Ethics. Page 37.
commits an act that is legally prohibited may face criminal charges and lose their license for practicing medicine. However, doctors who do not show enough compassion to their patients may be criticized by their colleagues and patients but whether they change their behavior is ultimately up to them.

Professional codes of conduct are different again. Oaths and codes typically describe the identity of a profession – who they are, what they should do, and what they aspire to be. For example, the Japan Medical Association has the JMA Guidelines for Physician’s Professional Ethics (2008). Although they are sometimes referred to as code of ethics, these guidelines sometimes have closer affinities with the law because their rules are enforceable by the threat of disqualification or marginalization from the profession. However, professional codes are not the law because they are created and enforced by the profession themselves and not by the state. In addition, although the code of ethics can encompass more-than-minimum duties and aspirations for its members, it is up to individual members to make efforts and aspire to be a “good doctor”.

In summary, while the law and ethics create obligations to individual doctors that may often overlap, it is important to keep them separate and think clearly about what kind of obligations doctors are under. Whilst there is arguably an ethical obligation on a doctor to respond to someone in an emergency, the question needs to be asked: is there also a legal obligation?

### 6.1 The Legal Obligations of Medical Professionals

The obligations that physicians have under the law to provide medical assistance in public emergencies can vary in different countries and across jurisdictions. For example, some countries have ‘Good Samaritan’ laws that reduce the liability of bystanders who come to the aid of others in need of assistance. While no such law exists in Japan, the liability of physicians who provide voluntary medical treatment in emergency situations may be reduced under the Civil Code (1896, as amended 2006) in Article 698, which set rules on “urgent management of business”. Under this rule, physicians shall not be liable for damages resulting from their voluntary assistance in an emergency situation unless “he/she has acted in bad faith or with gross negligence”. However, it is important to note that this law does not compel physicians to act in an emergency situation.

Under the Medical Practitioners Act (1948, as amended 2008), physicians working in Japan have legal duties to respond to requests for medical treatment. According to Article 19(1):
No medical practitioner who provides medical treatment shall refuse any request for examination or treatment without just cause.

This law may apply to physicians in relation to the patient(s) whom he/she is currently in charge of, although no penal sanction is attached in the case of abandonment where a physician flees or resigns from his/her place of work. In these cases, Article 218 (Abandonment by a Person Responsible for Protection) of the Penal Code (1907, as amended 2007) may apply:

When a person who is responsible for protection of a senile, immature, physically disabled or sick person, abandons, or fails to give necessary protection to such person, the person shall be punished by imprisonment with work for not less than 3 months but not more than 5 years.

However, this Article may not apply if the patient is transferred to some other physician or hospital for their care although, in general, this responsibility would likely fall onto the institution rather than an individual doctor. As for the duty of doctors who are not located in or near a disaster zone, there are no specific laws in Japan that would force physicians to travel to an affected area and offer assistance.

Outside the law, further guidance is provided in the JMA Guidelines for Physician’s Professional Ethics (2008). Interpretation of Article 19(1) of the Medical Practitioners Act is expanded in Section 2(8), which states that, where possible, a physician must comply with a patient’s request to provide medical care, particularly “when there is an urgent need for treatment”. However, a physician may refuse to treat where there is “justifiable reason”. Such reasons may include “working outside a specialty, working outside business hours, and the past nonpayment of medical fees”, although controversy surrounds their use as “just causes” for refusing treatment. If the situation permits, the JMA recommends that medical treatment should be provided even if outside duty hours. If a specialist is required and the situation is not urgent, then the patient should be referred to an institution with specialists. However, in emergency situations, physicians should provide first aid as far as possible after informing patients that they are not specialists.

The World Medical Association has issued a Statement on Medical Ethics in the Event of Disasters (1994, as revised 2006), although no specific guidance is offered on the obligations of doctors to assist in or near disaster zones. Annotations to the JMA Guidelines do, however,
make reference to guidance from the American Medical Association (AMA). According to the AMA’s *Code of Medical Ethics* (1957, as revised 2001), physicians working in the United States are privileged with the autonomy to be “free to choose whom they serve”, *except in emergencies*. In other words, the autonomy of physicians to pick and choose their own patients, at least in the United States, may be overridden by societal obligations during a public emergency. Opinion 9.067 on Physician Obligation in Disaster Preparedness and Response in the AMA *Code of Medical Ethics* (Ibid.) states:

> Because of their commitment to care for the sick and injured, individual physicians have an obligation to provide urgent medical care during disasters. This ethical obligation holds even in the face of greater than usual risks to their own safety, health or life.

Therefore, even though physicians may not be required by law to enter into a patient-doctor relationship with people injured in a disaster, or remain in and around the affected area, it is regarded as a matter of professional ethics to assist when possible. Indeed, Section 2(9) of the JMA Guidelines states that in emergency situations, “the physician should voluntarily provide care to the extent possible”. The ethical justifications that support these obligations are discussed in the following section.

### 6.2 The Ethical Obligations of Medical Professionals

Few scholars, if any, would agree that physicians should be ethically or legally obliged to treat patients in public emergencies without any regard for their own safety. For example, physicians would not be expected to place themselves in immediate danger of injury or death during the acute phase of a disaster. However, what are their moral obligations to remain with their patients and offer assistance? For instance, what about physicians who work in hospitals that are admitting patients with a highly contagious and virulent influenza virus, or are located in the vicinity of an area exposed to radiation contamination? Should they stay and assist in spite of the potential health hazards to themselves?

While some scholars would answer ‘yes’ to these questions, not all agree that physicians’ professional obligations should always take precedence over their personal commitments (to family/children etc.) or that they should be obliged to practice in places that might be unsafe.
Some of the main ethical arguments that are offered in the literature for and against such obligations are shown in Table 6.1 and summarized in the following.

In support of an ethical obligation to treat, it is generally reasoned that physicians have special training in medicine that is essential to disaster management and that they, either expressly or implicitly, agree to provide care during public emergencies as part of their chosen profession. It is also posited that physicians receive significant societal benefits, such as high social standing and opportunities for wealth creation that are given on a reciprocal basis: the social contract requires physicians to render their expertise in times of need. Others point to the oaths and codes of ethics that physicians agree to observe when entering the profession and the need to show solidarity with work colleagues and support the wider medical community in challenging times.

A number of objections have been made to these arguments. While certain risks may be intrinsic to the profession, it is argued that the types of harms that may arise during a public emergency are often uncertain and may be unknown when a physician enters the profession. The societal benefits that physicians receive may vary between individuals meaning that greater burdens could be placed on some physicians who have not enjoyed the same privileges as others, which may be unfair. Some scholars have also argued that the concepts employed in codes of ethics and oaths are too vague and imprecise to impose a moral duty on physicians working under extreme conditions.
# Table 6.1: Ethical justifications for/against physicians assisting in or near disaster zones

<table>
<thead>
<tr>
<th>Ethical Justification</th>
<th>For</th>
<th>Against</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special Training</td>
<td>The specialized knowledge, skills and access to resources that physicians have creates a duty to respond and provide care in public emergencies as others in the community may lack this ability.</td>
<td>The ability to provide care does not create a special duty to respond in a public emergency as others in the community may be more able to assist without incurring significant risks to themselves.</td>
</tr>
<tr>
<td>Expressed Consent</td>
<td>Physicians consent to expose themselves to risks of harm associated with emergencies as part of their job description in employment contracts.</td>
<td>Significant risks to one’s welfare are not routinely specified in employment contracts.</td>
</tr>
<tr>
<td>Implied Consent</td>
<td>Physician’s consent to expose themselves to risks of harm associated with public emergencies is implied when they enter the profession.</td>
<td>Consent cannot be implied when specific risks of a public emergency are not an essential part of a specialized field.</td>
</tr>
<tr>
<td>Reciprocity (Social Contract)</td>
<td>Society gives physicians special privileges with high social standing, education and economic opportunities, and the ability to self-regulate. In return for these benefits, physicians are obligated to provide their expertise in public emergencies.</td>
<td>The social contract is made with the profession as a group, not individuals. The acceptance of benefits, which may differ with individual physicians, does not generate a duty to significantly risk their own welfare in order to aid another.</td>
</tr>
<tr>
<td>Oath &amp; Codes</td>
<td>The codes of ethics and oaths that physicians make when entering the profession to provide care whenever required creates an obligation to respond in public emergencies.</td>
<td>Codes of ethics and oaths are symbolic and too imprecise to create obligations for physicians to respond in specific public emergencies.</td>
</tr>
<tr>
<td>Solidarity</td>
<td>Physicians are part of a wider medical community that must respond in public emergencies. Physicians who refuse to assume risks of harm to themselves impart this risk onto colleagues.</td>
<td>The concept of solidarity is too vague to serve as a standard for physician behavior in times of emergency.</td>
</tr>
</tbody>
</table>

1 Malm et al. (2008)
2 Wynia (2007)
3 Anantham et al. (2008)
4 Akabayashi (2012)
The decision to assist in a public emergency, or not, may therefore be very difficult. On the one hand, the physician may feel a strong desire to remain in, or travel to, a disaster zone to provide medical care. They may feel strongly about supporting their employers and colleagues, who will surely be under strain if fewer physicians are available to assist. On the other hand, physicians who have young children or elderly parents to care for may worry about their welfare and feel an even greater need to ensure their safety over the wellbeing of unrelated patients.

In arriving at a decision to stay or go, it may be helpful to look beyond questions of risks and benefits and ask what it means for a physician to be a ‘good doctor’ (Akabayashi, Takimoto and Hayashi 2012). This question can be addressed within the framework of virtue ethics. This approach considers the embodiment of values and character that determine ethical behavior. For example, brave, compassionate and selfless might be considered as characteristics of a virtuous doctor acting in public emergencies. Recognition that the decision to assist in a disaster may go beyond what is ordinarily expected from the social contract might help physicians to reconcile the many conflicting obligations they are likely to face when needed in a public emergency.

Case Study: Dr. N (Akabayashi 2012)

Dr. N is an internist working at a hospital a little more than 20km away from the Fukushima Daiichi Nuclear Power Station when the Great East Earthquake struck and news spread about a meltdown. When the Japanese government issues an evacuation notice to those living within a 20km radius of the power plant, her parents plead for her to return to the family home in Hiroshima. She is reluctant to leave because she has patients at the hospital and cannot refer them to other doctors due to the loss of staff who were affected by the tsunami. However, as the United States had issued directives advising its citizens residing within an 80km radius to evacuate, she is uncertain about the risks of radiation exposure. Her parents are also concerned about the potential impacts of radiation exposure on her reproductive health and insist they need her support in Hiroshima. She asks the head of internal medicine if she may leave to be with her parents.

Questions:

1. What are Dr. N’s legal obligations to her patients at the hospital where she works?
2. Should she be allowed to resign from the hospital and return home?
Concluding Remarks

Physicians in Japan are not legally obliged to assist in public emergencies, nor are they obliged to travel to a disaster-affected area. If a physician wishes to leave an affected area, they are unlikely to be penalized for abandoning their patients if other arrangements are made for their transfer to another physician or hospital. As for a physician’s ethical obligations, while there is broad agreement that physicians should continue to provide care during public emergencies, and assist when possible, there are limits to how much risk physicians can be expected to assume during a major event. However, what is considered as an acceptable level of risk for the societal benefits that physicians receive is disputed and may vary according to the circumstances of individual physicians. Thus, rather than limiting the question to balancing risks and benefits, consideration may also be given to the virtues that reflect the character of a good doctor.

6.3.1 Key Learning/Take Home Message

- The law and ethics may create different obligations for the conduct of individual doctors in public emergencies.
• Doctors working in or near a disaster zone in Japan do not necessarily have a legal duty to provide medical assistance to people in public emergencies.
• Doctors working away from a disaster zone in Japan do not have a legal duty to provide medical assistance to people in public emergencies.
• Physicians may be ethically required to assist in disaster zones.

Questions and Answers

(1) What are two main differences between the law and ethics?
   i. The law expects us to behave toward others in a way that is reasonable, while ethics expects us to act for the good of others.
   ii. The law may be enforced with sanctions, while ethics relies on one’s conscience and social influences.

(2) Are physicians in Japan legally obliged to travel to disaster zones to provide medical assistance?
   No. There is no law in Japan for ordering doctors to travel to an affected area to offer assistance.

(3) Will physicians be penalized under Article 19 of the Medical Practitioners Act if they refuse to remain in or near a disaster zone to treat patients?
   No. There are no penal sanctions attached to the Medical Practitioners Act.

(4) What are pros and cons of Implied Consent argument for doctor’s obligation to assist in or near disaster zones?
   Pro: Physicians implicitly consent to expose themselves to risks of harm associated with public emergencies when they enter the profession.
   Con: Consent cannot be implied when specific risks of a public emergency are not an essential part of a specialized field.

(5) How would you characterize a good or virtuous doctor in public emergencies?
   This is an open-ended question where students must come up with their own answers.
Acknowledgements

Many thanks are owed to Ms. Hiroyo Ando from the Division of Human Health, International Atomic Energy Agency, for English translation of the JMA guidelines.

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CHAPTER 7

LEARNING ACROSS DISASTER: REBUILDING HEALTH

Kim Fortun

Whenever we pride ourselves upon finding a newer, stricter way of thought or exposition; whenever we start insisting too hard upon "operationalism" or symbolic logic or any other of these very essential systems of tramlines, we lose something of the ability to think new thoughts. And equally, of course, whenever we rebel against the sterile rigidity of formal thought and exposition and let our ideas run wild, we likewise lose. As I see it, the advances in scientific thought come from a combination of loose and strict thinking, and this combination is the most precious tool of science.

Gregory Bateson, "Culture Contact and Schismogenesis"

Explanatory pluralism, I suggest, is now not simply a reflection of differences in epistemological cultures but a positive virtue in itself, representing our best chance of coming to terms with the world around us.

Evelyn Keller, Making Sense of Life: Explaining Biological Development with Models, Metaphors, and Machines

Summary

This chapter will introduce readers to research by historians and social scientists that identifies recurrent issues in disaster response in different settings, focusing on challenges in efforts to rebuild health. The chapter will highlight recurrent challenges faced by disaster survivors, and by technical professionals (including medical professionals) responsible for aiding disaster recovery. The chapter highlights the need for conceptual and operational innovation in disaster contexts, integrating and leveraging many different kinds of knowledge.

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Learning Objectives

After reading this chapter the reader will be able to:

1. Have enhanced understanding of recurrent issues faced by survivors and technical professionals in different disaster contexts
2. Describe the structures and dynamics of disaster
3. Reason and develop a response to a specific disaster context
4. Generalize learning through the application of analysis and evaluation techniques to prepare a creative response to disaster

Keywords: Disaster recovery, knowledge politics, information deficits, public health programs, thought styles

Introduction

How do different kinds of people – in different time and places – experience disaster? What problems have emerged in different disaster recovery efforts? What challenges are faced by technical professionals responsible for facilitating disaster recovery? What does it look like to rebuild the health of individuals and communities after disaster?

These questions are at the heart of research in the emerging subfield of disaster Science and Technology Studies (STS), which brings together work by anthropologists, sociologists, historians, political scientists and others working to understand the human dimensions of disaster, with a special focus on the roles that technical professionals of many kinds – engineers, scientists, and physicians, for example – play in disaster preparedness and response. This extends a large body of work in the humanities and social sciences focused on how individuals and communities are impacted by disaster, on disaster communication and news coverage, and on the role of governments in disaster prevention and response. The goal of disaster-STS is to develop comparative perspectives on disaster so that people can better recognize recurrent structures and dynamics of disaster, while also becoming attuned to the ways every disaster is unique and shaped by context.

7.1 Learning across Disaster

A key focus of STS research is on the “thought styles” of differently positioned and educated people, including scientists, physicians and engineers. A “thought style” is a habitual way of conceptualizing problems, data, facts, what requires explanation, and what counts as a good explanation. Importantly, “thought styles” are collective; thought styles are produced by communities of practice as they work,
talk and exchange ideas. Often, the shared assumptions embodied in a thought style are tacit; they aren’t talked about explicitly, despite shaping the way people prioritize concerns and organize their work.

The unstated aspects of thought styles intensify the challenge of working across thought styles – as when scientists from different disciplines try to work together, or when physicians try to work collaboratively with their patients to understand the sources and experience of disease. In contexts of disaster, the interplay of different thought styles poses particular challenges – because of the urgency of working collaboratively, because disaster so often generates problems that are different in kind and complexity than those dealt with previously, and because critical information for thinking about the problems at hand is often missing, sometimes intentionally. Indeed, a useful definition of disaster is harmful phenomena that cannot be adequately addressed using established procedures, operational or conceptual.

Disaster impacts conceptual as well as technical infrastructure in the environments in which they occur, and there are often conflicting interests behind competing perspectives on what is going on. Governments and corporations with responsibilities in disaster contexts often constrain information flows, for example, sometimes trying to prevent panic, sometimes trying to cover-up operational failures. Information and knowledge politics are always part of the dynamics of disaster.

People responding to disaster thus need to draw on earlier experience, education and established procedures – on cultivated “thought styles” -- while also acknowledging that disaster always requires new ways of thinking and acting. As the quotes above suggest, thinking in disaster needs to be both strict and loose, styled and open. Thinking in disaster also needs to be attentive to different thought styles, the various ways differently positioned people will see the problems at hand; this is the explanatory pluralism identified by Keller (2002) as a critical advantage in apprehending complex phenomena. Different kinds of understanding and explanation can be vital resources in disaster, offering the best chance of coming to terms with unfolding events, information deficits and what STS researchers call “knowledge politics.”

Figure 7.1: Rabbit-duck Illusion, from the Fliegende Blätter issue on October 23, 1892. Translation of caption: “Which animals are most like each other? Rabbit and duck.”
Austrian-British philosopher Ludwig Josef Johann Wittgenstein used the image in Figure 7.1 (published earlier in a German humor magazine) to illustrate how the same thing can be seen differently, from different angles (1953). In disaster contexts, recognizing how different people see unfolding events differently can be leveraged for better overall understanding, helping offset problems associated with information deficits.

Figure 7.2: The Intelligent Eye (Gregory 1970), photo by Ronald C James

Figure 7.2 points to the challenge of seeing phenomena — distinguishing figure from ground — without prior knowledge about what one is looking for. Once a viewer is told that they should see a dog in this image, for example, the dog becomes much easier to see. This poses special challenges in disaster contexts given the ways disasters generate entangled problems, often without precedent. In disasters, there are always things to see, understand and respond to, which are very difficult to see through established analytic frameworks. For additional help seeing the dog here, see http://www.michaelbach.de/ot/cog_dalmatian/.

7.2 Structures and Dynamics of Disaster

Disaster is often defined as a sudden event that disrupts normal functioning of a community or society; often, disasters are also cast as intricately unique, and bounded in time. Research across disaster contexts, however, confirms that disasters are extremely enduring. They continue, often without end. Often recovery efforts come to be talked about as “second disasters” (Fortun 2001).
Research also confirms that there are recurrent dynamics and challenges across disaster contexts – in the lead-up to disaster, in the instance and experience of disaster, and in disaster recovery initiatives (Fortun and Frickel 2012). Awareness of these dynamics and challenges, acquired by working through different disaster cases, provides a kind of disaster literacy that improves capacity to “read” new disasters as they unfold.

One recurrent dynamic emerges from the fact that disasters, by definition, reveal that something has gone wrong. Disasters are failures, usually of many kinds. This often provokes secrecy, about the impacts of a disaster as it unfolds, about the causes of a disaster, and about continuing organizational incapacity to deal with a disaster. Government agencies implicated in disaster often constrain information flows, for example, striving to cover up their mistakes or to mitigate public anxiety, or simply because they don’t have the capacity to process and communicate the data available to them. Often, efforts to anticipate or prepare for disaster were misdirected; this implicates operational efficacy (the availability of appropriate equipment and personnel for immediate response, for example) and can exacerbate secrecy. Actors may be reticent to admit that they prepared for the wrong disaster; they also may not have infrastructure in place for collecting, analyzing and sharing data on the disaster actually at hand.

Data is always a problem in disaster contexts, in multiple ways. How data is collected delimits what problems are recognized. Often, data is released without means to interpret it. Different nations or units of a government may collect data that is configured differently, making it difficult to discern where there are contradictions and where there is complementarity. Increasingly, citizens’ organizations are involved in data collection and circulation in disaster contexts, leveraging relatively low cost monitoring technologies and social media. Citizen produced data is often more granular and real-time than data produced or made available by government actors, making it particularly useful for local level decision-making by individuals and families as well as local governments. This often generates continuing and important debate about the quality and credibility of different sources and ways of configuring data. Such debates are particularly intense when there is concern about government information withholding, and subsequent failures of trust. Disasters thus produce complex communication challenges, often involving a need for continually revised statements about what is going on. Technical professionals are often challenged to explain changing data and conditions to diverse audiences, and can play critical roles as advocates for transparency.

Technical professionals in disaster contexts also face complex ethical challenges of many kinds. Often, for example, technical professionals themselves and those that work alongside them face considerable risk – from damage to buildings and roads, toxic contamination, social unrest, etc. Technical professionals must make difficult assessments of the adequacy of their own working conditions, and often are responsible for the safety of those working with them as either paid
employees or volunteers. The urgency and tragedy of disaster makes these assessments especially difficult. New ways of thinking about risk and responsibility are often called for, though this can easily legitimize unfair imposition of risk on workers with restricted social status (because of age, gender, ethnicity, etc.). The need for thinking that is simultaneously “styled” by established protocols yet open and sensitive to its own limits and uncertainties becomes particularly acute.

Identification and categorization of victims is also a recurrent problem in disaster, exacerbated by evacuations and dispersal of people during the disaster. This can slow access to much needed relief, and create new social divisions; those who aren’t categorized as victims can become a new underclass. Predictable, as well, is the way disaster exacerbates previously entrenched social inequalities; people that were poor and politically marginalized before a disaster tend to be even more so after a disaster; gender, age and racial bias also tends to be exacerbated. Proving their status as victims, and negotiating what counts as a disaster-related harm, can thus become a major stressor for people impacted by disaster. Identification and categorization of victims also creates stress for doctors, who know that any diagnosis they provide can implicate access to resources.

Another recurrent dynamic in disaster emerges from the development of public health programs to address the injuries and disease produced by disaster. Such programs are often desperately needed, and must be put together with limited time and financial resources. Health professionals must determine the types of care that will be available, methods for assessing a need for care, and supporting documentation that will be required to secure access to care. These delimitations are a necessary part of the development of public health programs, but always marginalize some problems and people. Doctors need to help their patients develop ways of describing their health care needs in ways that fit with program requirements, but this comes at a cost. In learning to describe their ailments in terms that fit with public health programs, patients and their doctors can miss problems that aren’t recognized by these programs. Patients’ rights can also be reduced to those conferred by public health programs, undercutting broader rights and political engagement.

7.3 Rebuilding Health

Rebuilding health after disaster is complicated by many factors, including the thought styles of health professionals. Modern health care and research aims to identify the cause and mechanism of disease, progressively ruling out what is not determinative. The logic is binary: Is it X, or not? If not X, is it then Y, and not Z? Modern health care and research are also organized into disciplinary specializations, allowing for impressive depth of knowledge and analysis, but making it difficult to see “the whole (bodily, much less environmental) system.” And modern health care and research privilege “in-body” constructs of disease; environmental health stressors are often systematically
discounted. Health professionals in disaster contexts thus need to see phenomena that established frameworks don’t make visible. This often calls for intensive collaboration with patients to understand their injuries and illness from their perspective, and with scientists from different disciplines. The complex multidimensionality of injury associated with many disasters is difficult to deal with clinically and scientifically, and also culturally. Here, too, Bateson’s (1935/1972) challenging call for thinking that is both “formal” and “wild” is critical.

Health care in disaster is also complicated by what anthropologist Mary Jo Good (2007) has termed a “medical imaginary” that fosters belief that modern medicine can provide both explanation and cures for any range of ills. Even in the most difficult cancer cases, Good argues, there is often great expectation that biomedicine will come through – with clear explanations and solutions to the problem of illness. This drives people in varied positions – patients, family members, doctors, researchers, the media – to conceive, represent and deal with disease in a particular manner: one which is straightforward and clearly actionable. People want to know what, exactly, to do when someone is sick, and they count on health professionals to tell them. Injury and disease in disaster contexts are often much less straightforward.25

In disaster contexts, available information and procedures are always inadequate yet decisions must be made, often very quickly. This poses deep challenges for people acting as individuals of responsibility - as heads of families, as professionals, and as representatives of governments and corporations. They must simultaneously draw on prior experience and established knowledge and recognize that they are dealing with an unprecedented situation, with limited information. Often, understanding and decision-making can be improved through collaboration that brings the expertise of different positioned people together, leveraging (rather than just trying to manage) differences in thought styles and ways of seeing things. Drawing people from different scientific disciplines, government agencies and sectors (academia, business, government, NGOs) into collective deliberation has critical value, as does inclusion of women, youth, and others often left out of decision-making arenas. Explanatory pluralism is especially valuable in disaster contexts.

Disaster recovery programs are themselves often disastrous, failing to rebuild health, economic security, social support and political capacity. The research literature is replete with examples of this. Recovery initiatives clearly improve when survivors are allowed to participate in the design of recovery programs, but participatory schemas themselves often create problems. Participatory schemas often enroll people with the greatest cultural authority and sense of their own political agency, reproducing long-entrenched social hierarchies. Participatory schemas often also lack

25 The two paragraphs here about medical imaginaries and the binary logic of disease determinations are drawn from a 2014 article entitled “Asthma, Culture, and Cultural Analysis,” which I co-authored with others in the Asthma Files Research Group. See under “Further Reading” for a full citation.
durability, failing to integrate the many types of expertise needed to conceptualize robust recovery, or a means to sustain diverse involvement across time and generation. Familiarity with failures of disaster recovery efforts is sobering, yet contributes to a disaster literacy from which better recovery efforts could emerge. A key challenge is in enabling both strict, historically informed ways of thinking, and loose, innovative ways of thinking, attentive to both recurrent dynamics across disaster and to the special needs and conditions that every particular disaster creates.

Physician-anthropologist Paul Farmer (1996) calls for a “critical epistemology of disease” through which medical professionals continually question the adequacy of the conceptual and organizational models relied on in efforts to build health. According to Farmer, medical professionals need to continually evaluate not only the efficacy of their models and associated programs, but also what these models and programs leave out. Farmer makes this argument as part of his long-running work to understand and improve health in the poorest regions of the world. His initial work was in Haiti; he also has worked extensively in Africa. In these contexts, poor health, according to Farmer, results not only from infectious agents, environmental contamination and inadequate health services, but also from a long history of colonial exploitation and continuing social inequality. Models of disease emergence need to be continually updated to address these many variables, striving to be “global yet alive to local variation,” always questioning what features of disease emergence are obscured in dominant analytic frameworks. As a matter of routine, Farmer insists, medical professionals – collaborating with others – need to continually ask, “What is obscured in this way of conceptualizing disease? What is brought into relief?”

7.4 Conclusion

Critical perspectives on the knowledge frameworks and thought styles used to understand disease are important in all disaster contexts, especially when dealing with radiation and chemical exposures that could have cumulative effects that are difficult if not impossible to anticipate with available data, methods and established environmental health knowledge. Medical professionals in disaster contexts thus need to be attentive to the limits and politics of knowledge as they continue to use their knowledge to care for patients and plan health care programs. This is a key challenge for medical professionals, and one that they can prepare for psychologically and intellectually.

As noted earlier, research has made clear that disaster impacts conceptual as well as technical infrastructure in the environments in which they occur, and that there are often competing interests
behind competing perspectives on what is going on. Simply knowing this about disaster can advance capacity to deal with disaster. Learning about the ways different disasters have unfolded can provide the intellectual and psychological grounds for making sense of a disaster context in which one works. The challenge is multifold: one must anticipate the chaos, information deficits and knowledge politics of disaster, knowing that this is part of disaster; the intellectual challenge harbors a paradox: one must anticipate the impossibility of fully anticipating the conditions and demands of disaster. Disaster literacy thus builds on a rich repertoire of examples to think through the dynamics, contradictions and obligations of disasters as they unfold, mindful of both recurrent patterns and of ways each disaster poses fundamentally new challenges, demanding creative and innovative response.

Questions and Answers

*What challenges do technical experts (including medical professionals) face in disaster contexts?*

Technical experts face a number of challenges in disaster contexts. Six of these challenges stand out:

1. Data about disaster and associated problems are often very volatile, requiring experts to continually analyze the source and validity of available data, while using the data to update their understanding of the problems at hand. The design of data collection efforts forcefully shapes what is known about problems, calling for inclusive and deliberative processes in all phases of effort to understand disaster.

2. Disasters create complex and evolving problems, requiring experts to utilize the knowledge and skill they have developed through years of training and experience while recognizing the limits of previously codified knowledge and skill. Disasters pose fundamentally new problems, which are difficult to apprehend with established ways of thinking. Expertise can produce both insight and blindness, and this is amplified in disaster contexts.

3. Disasters often exacerbate social problems that existed before disaster, such as income, gender and ethnic inequalities, and insensitivity to the needs of different groups. At every stage of their work, technical experts need to question whether and how these groups and needs can be addressed, recognizing the value of including people in decision making that are usually left out.

4. Given the complexity and volatility of problems in disaster contexts, technical experts often need to collaborate with others much more intensely than they are accustomed to. Complex understanding of individuals and communities in disaster contexts necessarily includes qualitative as well as quantitative dimensions, for example, and thus depends on collaboration between researchers with different skills, including skills that elicit feedback and enable learning from people directly impacted by disaster.
(5) Disasters create an immediate need for experts to communicate to diverse audiences, including journalists, policy makers and people impacted by the disaster. Technical experts thus need to be prepared for this communication challenge, mindful of the ways trust can be undermined by information withholding, and of the importance of trust in collective effort to respond to disaster.

(6) Technical experts and those that work with them in disaster contexts are themselves often subject to considerable risk, requiring difficult assessments – both technical and ethical – of working conditions, and the possible need to evacuate. The instability of built structures, toxic contamination and social unrest, for example, often threatens those responding to disaster, whether as paid employees or as volunteers. In trying to respond to the urgency and tragedy of disaster, technical experts must ensure to adequately protect their own health and that of co-workers. Special care must be taken not to impose risk on co-workers with restricted social status because of age, gender, ethnicity, etc.

References


Further reading


<table>
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<th><strong>Glossary</strong></th>
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<tr>
<td><strong>Adaptive expertise</strong></td>
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| **Distributive justice** | A socially just distribution that emphasizes that the outcomes or benefits are fair for those who carry the
Ecological approach to health

An ecological perspective on health that emphasises both individual and contextual, or environmental systems, and the interdependent relations between the two; by contextual systems one should understand political, social, economic, and cultural contexts that are locally specific.

Empowerment

A social process by which individuals or groups gain control over those issues (including health issues) that are of concern to them.

Equity

Where the decision taken is fair and impartial such that no person is favoured over another. Can also refer to equity in opportunity, access to resources, or the achieved distribution of societal resources.

Experience

Knowledge or skill which comes from practice in an activity or doing something for a long time, rather than from books or articles.

Expertise

i. Adaptive

The development of a conceptual understanding that allows the “expert” to invent new solutions and new procedures to solve problems; the demonstration of flexible knowledge handling; the understanding of learning trajectories for non-routine expertise.

ii. Contributory

The ability to contribute to analysing and solving a specific problem by drawing together different sets of information from research as well as other information sources.

iii. Counter

A construction by members of civil society to control classical expertise as well as to allow for alternative interpretations of risk and of the information collected by classical institutions.

iv. Interactional

Expertise that emerges through complete immersion in a specific problem context; the learning of an expert community to use the language of another expert community; the capacity to actively engage with the knowledge and experience available in another community.

v. Routine

The mastering of well established procedures of finding solutions in such a way as to become highly efficient and accurate.

Explanatory pluralism

The diversity of explanatory styles being used in scientific practice, which reflect the variety of knowledge-seeking methods researchers bring to their work, as posited by Evelyn Fox Keller in *Making Sense of Life: Explaining Biological Development With Models, Metaphors, and Machines* (2002).

Explicit knowledge

See under Knowledge (i).

Fiduciary duties

The legal duty of medical professionals to care for their patients and ensure that their decisions and actions serve the welfare of their patients, even at some costs to themselves.

Health

A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

Holistic approach

A concept that the psychological, physical and social needs...
Illness  
The subjective experience of feeling unwell.

Interactional expertise  
See under Expertise (iv).

Justice  
Conformity to the principle of what is morally right, or to fair and transparent procedures for societal decision making.

Knowledge  
i. Explicit  
Knowledge that can be articulated verbally and in writing, is often codified, and circulated and stored often in form of print media.

ii. Local  
Knowledge that is shared locally and historically by the residents.

iii. Scientific  
Knowledge that is produced by a community of scientists through their experimental and interpretative conventions that have been agreed to within relevant communities of scientists.

iv. Tacit  
Knowledge that is difficult to transfer to another person in written or verbal form. People are often not entirely aware of their possession of this kind of knowledge or how it could be valuable and thus made available to others; it becomes visible through practice in a particular situation and is transmitted through social networks.

Linear no-threshold model  
See under Radiation protection models (i).

Local knowledge  
See under Knowledge (ii).

Medicalization  
The extension of the medical sphere into areas which have been previously outside of its realm.

Medical ethics  
An applied sub-discipline of moral philosophy concerned with the conduct of medical practitioners and their relationships with patients.

Neutral data  
“Data” without effect of any background value judgments: for example, value judgment to avoid nuclear power or that to promote nuclear power.

Probability  
The estimation of how likely it is that a statement is true or that an occurrence will happen.

Radiation protection models  
i. Linear no-threshold  
Risk of damage caused by ionizing radiation is directly proportional to the dose.

ii. Threshold  
Risk of damage caused by ionizing radiation below the threshold value is too small to be clinically important.

Rationality  
i. Scientific  
Rationality that is ensured by the scientific community.

ii. Social  
Rationality that is ensured by society.

Risk  
Possibility that something harmful or undesirable may happen to the individual. The concept of risk is always related to a “possibility” or “likelihood” that something bad may happen, to protect our environment or our health.

Risk communication  
The act or process of sharing opinions, feelings, or information on risk with others. In this process, the media plays an important role; for example, a rapid dissemination of information related to public health; public perception of
Risk management
The evaluation and identification of priority risks that will have a coordinated application of resources in order to limit and control the impact of an event.

Risk perception
The subjective judgement by an individual about the severity and type of risk from the hazard or threat.

Routine expertise
See under Expertise (v).

Scientific knowledge
See under Knowledge (iii).

Scientific rationality
See under Rationality (i).

Sickness
A condition of being sick as conceived of by the society and/or its institutions.

Social capital
Two interdependent elements according to Pierre Bourdieu: social relationships that allow individuals to claim access to resources possessed by their associates, and the amount and quality of these resources.

Social construct
A phenomenon or category that exists only because it was created and developed by society through social practice.

Social determinants of health (SDH)
Social, economic, cultural, and historical factors which are recognized to be powerful determinants of health in modern societies.

Social justice
Social justice in health focuses on health inequities and promotes the providing of structures and services which might ensure the general population has equal access to health care services regardless of income level, gender or education. Integrating social justice to health inherently reflects the SDH model (see social determinants of health).

Social medicine
An organised investigation since the 19th century of how multiple social and economic conditions impact health, disease, and the practice of medicine; it also fosters local conditions in which this understanding can lead to healthier societies.

Social rationality
See under Rationality (ii).

Social vulnerability
The lack of ability of people in a particular group to tolerate the adversity or stressors to which they are exposed.

Stigmatisation
A specific type of discrimination wherein individuals or groups are treated as (or suffer the experience of) being in disgrace or having a tarnished reputation.

Tacit knowledge
See under Knowledge (iv).

Techno-political culture
A specific deeply culturally entrenched way in which a society relates technological and social development.

Thought collective
A group of people who share a specific way of seeing the world as they work, talk and exchange ideas. In science, thought collectives are equivalent to scientific communities.

Thought style
A habitual way of conceptualizing problems, data, facts, what requires explanation, and what counts as a good explanation. Produced by a community of practice (see thought collective). Microbiologist Ludwik Fleck, who
developed early frameworks for historical and sociological studies of the sciences, defined the concept of “thought style” in the 1930s.

Threshold model
See under **Radiation protection models (ii).**

Tolerance dose
The amount of radiation that may be received by an individual that would be unlikely to cause permanent damage.

Trading zone
A metaphor to describe a problem space where different experts have to work together to find a solution; a specific language has to be developed which all kinds of involved experts can understand and use.

Uncertainty
Any situation of departure from the ideal of complete determinism.

Virtue ethics
An approach of ethics which focuses not the agent’s actions themselves but his/her values and characters that underlies them. So the primary normative question is “what a good or virtuous doctor would do in this situation?” rather than “what action would be right?”
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