

Better be prepared

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Chapter 8

Valorization

Today's national societal challenges – ranging from the energy transition and sustainability, to health care, agriculture, water, and food – in combination with innovative technologies – like digitalization – will both radically change society and will influence economic activities. Considering health care challenges, innovation is the key driver to move from a reactive approach towards a predictive, preventive, personalized, and participatory approach focusing on vital functioning citizens [1]. Innovation requires proper research to develop new knowledge, ideas, and products and bringing them from bench to bedside, to the community and back. However, a significant gap exists between developed knowledge in research practice and the actual improvement in health care practice [2].

Dutch universities have the legal task – besides education and conducting research – to overcome this gap and transfer knowledge for the benefit of society (Higher Education and Research Act [WHW], 1192, article 1.3). In 2004, this task was labeled by the Dutch Minister of Science Van der Hoeven under the term 'valorization' [3]. Valorization means 'the process of creating value from knowledge by making it suitable and/or available for economic and/or societal use and translating it into competitive products, services, processes, and entrepreneurial activity' [4]. However, the performance of valorization and many aspects of science are under discussion. The Dutch Science in Transition movement [5] prefers to speak of valorization in terms of societal impact, in which academics take more societal responsibility and not only produce knowledge in terms of scientific publications. Internationally, the European Commission published a document regarding 'Science in transition 2.0', discussing the necessary steps to change the dynamics of research to address societal challenges [6]. Furthermore, the Lancet published five papers regarding how to decrease research waste and improve research quality [7-11]. So, science performed in universities is expected not only to develop and transfer knowledge, but should also address societal challenges and contribute to societal benefits.

One specific challenge is the maintenance of people's vital functioning before, during, and after a major life event, such as surgery. High-risk patients opting for major surgery experience a decrease in their physical functioning due to their hospitalization and surgery. Some patients already experience a decrease in their physical functioning before surgery, due to their specific illness and/or due to the passive "sit, wait, and see" approach in the preoperative period by the patients themselves, their family, or by informal caregivers. After surgery, patients with a low level of physical functioning have an increased risk for postoperative complications, require extensive postoperative rehabilitation, and are more likely to have a re-admission [12].

This chapter reflects on the social and economic relevance of an at the niche level performed mission-oriented research program as described in this thesis. The research program involved a transition in perioperative physical therapy care, with the aim to improve a patient's physical functioning during a major life event episode, especially in patients undergoing elective hepatic or pancreatic resection. Additionally, it will elaborate on how this at the niche level performed mission-oriented research can contribute to the defined Dutch health care mission, which states that "by 2040, all Dutch citizens will live at least five years longer in good health, while health inequalities between the lowest and highest socio-economic groups will have decreased by 30%" [1] using the multi-level perspective framework.

SOCIAL AND ECONOMIC RELEVANCE OF A TRANSITION IN PERIOPERATIVE CARE

In order to be able to participate in society and to remain independent, optimal physical functioning is important. Being able to perform activities of daily life on a physical, mental, and social level increases quality of life and ensures the ability to engage in society. Besides the age-related loss of physical functioning, patients opting for surgery might experience a decrease in their level of physical functioning, especially those patients who are already vulnerable. Surgery for cancer in the hepato-pancreato-biliary tract involves complex procedures. Patients should be able to cope with the physiological stress response that coincides with hospitalization and surgery. When a patient is unable to adapt adequately to this physiological stress response, patients have a higher risk for a delayed postoperative recovery of physical functioning or even permanent loss of physical functioning.

In both the pre- and postoperative phase, the physical therapist – in co-creation with the patient, family, and other (in)formal caregivers – should support a patient opting for major surgery to achieve and maintain their own control (patient empowerment) regarding their level of physical functioning in order to prevent deterioration. Some physical therapy departments in Dutch hospitals have taken up this responsibility and have adopted pre- and postoperative strategies to maintain and improve a patient's physical functioning before and after hospitalization and surgery. However, there is still a large variation and gap between the current clinical perioperative physical therapy practice and the advised state-of-the-art evidence [13].

By knowing this gap between the evidence in the literature and clinical practice, an embedded science approach is a way to reduce the gap. An embedded scientist combines working in daily clinical practice with scientific evaluations of the delivered care by continuously monitoring,

improving, and evaluating health care interventions throughout the patient journey in the real-life context. At the niche level at the Maastricht University Medical Center+, the embedded science approach resulted in changes in daily clinical practice (e.g., an outpatient preoperative assessment unit to assess a patient's physical fitness and physical functioning, a community-based exercise prehabilitation network, and postoperative monitoring of a patient's physical functioning). Equally, it led to alterations in patient outcomes after elective hepatic and pancreatic resection (e.g., a reduced median time to recovery of physical functioning and a reduced length of hospital stay) [14]. Thereby, this approach created public value by validating and integrating so called 'point' solutions in the real-life context of patients, leading to better patient outcomes in terms of physical functioning.

At the same time, the embedded science approach enables to create new theories and perspectives about perioperative physical therapy management at a micro (department of physical therapy), macro (interdisciplinary teams), and meso (regional prehabilitation network or national) level. This at the niche level performed mission-oriented research program resulted in adaptive academic partnerships between patients, health care professionals, and researchers within the Maastricht University Medical Center+ (micro and macro level), and led to co-production in exploring new forms of knowledge, values, and social relations.

An additional argument for optimizing perioperative care might be the potential return of investment in preventive perioperative physical therapy interventions. For example, median costs of an uncomplicated pancreatoduodenectomy are €17.500; however, these might increase by 34% to 71% when a complication occurs [15]. One should be aware that the average annual investment in an embedded scientist is €51.118, and the median investment in prehabilitation for a single patient is €320 (8 sessions of 30 minutes, €40 for each session), leading to a 25% improvement of a patient's level of physical functioning, as shown in a single case (*Chapter 6*). In the four years of this mission-oriented research program, a reduction in median hospital length of stay (4 days in pancreatic resection and 1 day in hepatic resection) and a reduction in median time to recovery of physical functioning (3 days in pancreatic resection and 1 day in hepatic resection) was observed, which might be attributed to changes in health care practices. In a recent cost-consequence analysis of Barberan-Garcia et al., [16] prehabilitation in high-risk patients undergoing major abdominal surgery reduced postoperative complications (relative risk of 0.5; 95% confidence interval ranging from 0.3 to 0.8) without increasing direct health care costs; hence, prehabilitation seems a cost-effective preventive preoperative intervention when

performed in high-risk patients. These economic considerations might be an additional argument to take a closer look into the business case of optimizing perioperative care.

PRACTICAL INNOVATIONS

The initiation of the transition towards a proactive perioperative physical therapy care pathway resulted in several (sustainable) changes at the Maastricht University Medical Center+ related to the preoperative phase, postoperative phase, and collaboration in learning communities.

Preoperative physical therapy

Since 2016, patients who are diagnosed with cancer in the liver or pancreas and opt for elective abdominal surgery can participate in a preoperative screening of their level of physical functioning and physical fitness as part of usual care. During this screening, several practical performance-based tests are performed, where after patients receive information regarding the results and an advice on how to prepare themselves for surgery. Data from the preoperative screening were used in the cohort studies (*Chapter 4* and *Chapter 5*). In these studies, the conventional patient-related medical (American Score of Anesthesiologist score) and demographic (body mass index) were associated with the time to recovery of physical functioning. Besides these conventional patient-related medical and demographic risk factors, people with a lower aerobic capacity, a worse functional mobility, and a lower perceived level of functional capacity to perform activities of daily life were more likely to experience a delayed recovery of physical functioning after surgery. These results emphasize the importance of an adequate level of physical functioning before major surgery but also emphasize the importance of a proactive role of the physical therapist. Nowadays, this knowledge is used as part of usual care to inform patients regarding the importance of physical activity and physical fitness. Patients with an increased risk for a delayed recovery of physical functioning have the opportunity to participate in a home-based functional exercise training program.

Postoperative physical therapy

Nowadays, daily monitoring of a patient's recovery of physical functioning is an integral part in the postoperative physical therapy care for patients who underwent hepatic or pancreatic resection. The modified Iowa level of assistance scale (mILAS) is used to monitor five functional tasks related to physical functioning. Furthermore, also other practical performance-based-tests of relevance for the patient (e.g., five times sit-to-stand test, two-minute walk test) are used to monitor recovery of physical functioning. Based on the test results, frequency and intensity of physical therapy is

adapted. In addition, a poster was designed to create more awareness regarding the importance of physical activity during hospitalization. This poster contains activities of daily living (e.g., bathing, eating, walking, climbing stairs) and the level of (in)dependence performing these activities.

Transfer of knowledge in learning communities

The knowledge developed within this thesis is due to collaborations between patients, caregivers, and scientists, who share the same common goals to improve perioperative care (e.g., participated in a learning community). Within the catchment area of the Maastricht University Medical Center+ (30 km), a learning community was established. Within this learning-community, there was a co-creation between the 'tacit' knowledge of practitioners in the field in combination with scientific and process knowledge of researchers. This led to a co-evolving theory and improved patient outcomes, which was due to a change in daily clinical practice in the perioperative management of patients that decided to undergo major elective abdominal surgery because of hepatic or pancreatic cancer. As part of this learning community, a prehabilitation network with trained community physical therapists was developed to support and train high-risks patients in their own living context. Each community physical therapist committed to the network followed a three-day course and a decision-support guideline was developed regarding the home-based functional task training with a small group of physical therapists from the prehabilitation network. Nationally, a Dutch learning community of practice, consisting of clinicians, embedded scientists, and policy makers working in the field of perioperative physical therapy care, shared practical experiences and research insights, thereby aiming to improve perioperative care with patients opting for major surgery. By doing so, it is not only about maintaining and improving a patient's physical functioning throughout the people's journey, but also about remaining critical towards the content and context of health care procedures.

FROM NICHE-LEVEL MISSION-ORIENTED INITIATIVES TOWARDS LANDSCAPE MISSIONS

The European Union is shifting towards a mission-oriented research approach to address global societal challenges [17]. Within this approach, a clear mission is defined and collaborations between public and private organizations, local communities, non-governmental organizations, and other societal actors are set-up to achieve societal impact and pursuit economic growth [10]. The Dutch Ministry of Economic Affairs and Climate Policy endeavors this mission-driven innovation policy with collaboration within the quadruple helix (citizens, governments, entrepreneurs, and researchers) to address societal challenges [18]. The central mission for the

Dutch health care transition is as follows: “In 2040, all Dutch people will live in good health for at least five years longer, and the health differences between the lowest and highest socioeconomic groups will have decreased by 30%” [1]. The mission-oriented approach to system innovation is not a top-down approach, but rather creating an environment of a living-lab in which experimentation, policy learning, and stakeholder participation is encouraged [10]. The question remains how to create such an environment that bottom-up initiatives – like the niche mission-oriented research in perioperative physical therapy care – will not stagger. By making use of the multilevel perspective framework, this thesis aimed to provide an overview of the actions that could be undertaken to drive the optimization of perioperative care at niche level.

The multi-level perspective in the perioperative care transition

The multilevel perspective describes a societal system at three levels (micro, meso, and macro), in which system-innovations (transition experiments) interplay between different levels and in different phases (see Figure 8.1) [19, 20]. Bottom-up experiments at the micro-level are called niches. These niches provide space for learning processes in which different actors find out if novelties based on scientific research are value-adding to the patient and will improve perioperative care. The meso-level is called the socio-technical regime, and accounts for the stability in the existing routine perioperative care setting. Regimes encompass technologies, institutions, and actors who change incrementally. The macro-level, also called the socio-technical landscape, cannot change in the short-term, and is beyond direct influence of the actors in the transition experiments. However, it can put pressure on the existing regime and/or opens a window of opportunity for niche experiments.

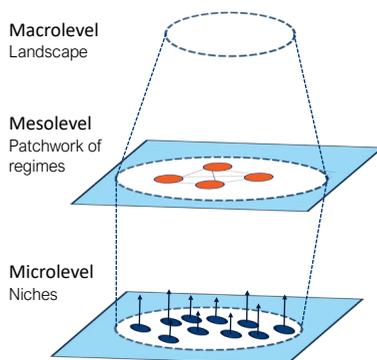


Figure 8.1. The different scale levels of a transition (modified from Geels [20]). Bottom-up niches, the top-down landscape, and regimes within perioperative health care to improve physical functioning throughout the people’s journey are depicted.

Niche

A niche can be seen as a group of actors who co-create in order to develop deviating innovative social, economic, and technological practices, and are protected from the dominant regime [19]. In 2018, various regional and thematic niches were initiated in the Netherlands in order to maintain and increase the rate of innovations. These regional and thematic niches are called learning communities [21]. In these learning communities or so-called 'living labs', the quadruple helix joins forces to explore – with support of technological innovations – solutions for a specific challenge in a specific context [22, 23]. The local niche experiment in perioperative physical therapy care as described above – already functioning as a learning community – might consider exploring further collaboration with regional level learning communities. For instance, by learning from the living lab of healthy ageing and long-term care. In the latter mentioned living lab, interdisciplinary collaboration among citizens, embedded innovators, policy makers, and educators exists, and they are successful in creating an innovative care environment [24]. By broadening the learning community of perioperative care with more technology experts, technological innovations for maintaining a patient's pre- and postoperative level of physical functioning can be intertwined with socio-cultural innovations at the same time, in order to achieve sustainable implementations of innovations in the life of patients and/or the professional. Furthermore, niches can also make use of the Dutch Top Sector public-private-partnerships, in which multi-stakeholders in a specific field of expertise work together (intellectual, human, and financial capital) to perform science, but also to work on outcomes and deliverables with both social and economic impact [25]. For perioperative care, such a regional public-private-partnership has been set-up with patients, hospitals, universities, and national data registries to create a clinimetric composite toolbox for better predicting surgical outcomes in patients who undergo elective colorectal surgery [26]. The above-mentioned considerations are based on the idea that niche development should incorporate the quadruple helix in order to create a sustainable regional knowledge and innovation structure, in which local, regional (province), and national governments should help by investing in these infrastructures.

Regime

The regime is the dominant culture, structure, and practice in a system. Applying the theory of Geels [27], regime elements in perioperative care can be tangible (e.g., laws, guidelines, protocols, standard practices) or intangible (e.g., policy paradigms, organization structure, norms and beliefs). Important key actors in the regime and their associated institutional structures (e.g., hospitals, universities, health insurance companies, expertise networks) influence the regime

elements, and thereby determine the culture, structure, and practice in a system. Changes in the regime might develop when the regime is stressed by tension, which influences daily practice. For instance, surgical care is stressed by the ageing population [28]. Linking and introducing new initiatives in daily perioperative care that might solve these tensions might trigger readiness for change in the regime. Furthermore, the development of (international) guidelines regarding changes in perioperative care [29] creates more tangible elements to change the regime, but also influences norms and beliefs of health care professionals, which might influence their practices.

Another way to influence the regime lies within the commitment of key actors. Key actors in the regime with policy power in institutions might directly employ activities or new structures within their organizations to improve and expand new elements in the regime [20]. For instance, policy makers within universities or hospitals might reconsider their organizational structure to better adapt to the evolving environment and new technologies to improve their performance in terms of social and economic impact. Institutes might consider to change from a hierarchical silo structure towards a dynamic agile organization (see [Figure 8.2](#)) [30]. Key-actors working in a dynamic agile organization should aim to create an ecosystem with a dense network of empowered teams that enable them to learn and experiment beyond the boundaries of the regime. By doing so, policy makers can create cross-functional teams, which are also called dynamic capabilities of a company [31]. A dynamic capability is the ability to integrate (put resources together), build, and reconfigure internal and external competencies to rapidly adapt to the changing environments [32]. A cross-functional team can be seen as a learning community with diverse actors in the organization, in which people interact and work on a clear mission while being supported by cross-team performance management. So, policy makers for perioperative care should connect knowledge, technology, and finances between institutes, as well as create diverse teams by not acting from an ego-centered belief, but from an eco-centered belief. This new way of working and thinking will also tie in with the 'science in transition' initiative [5].

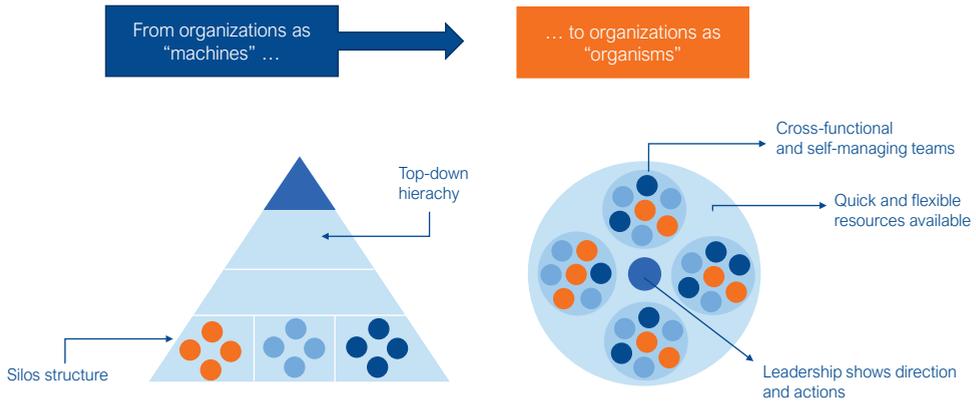


Figure 8.2. The change of the organization structure from a hierarchical silo structure with top-down leadership, towards a more ‘dynamic’ organization with cross-functional teams that are more able to act upon the changing environment (adapted from McKinesy & Company [30]).

Landscape

The landscape is beyond the influence of niche and regime actors, and contains political, economic, and social changes, which will take more time (decades) [27]. The landscape can put pressure on the existing regime so that potential niches have the ability to become incorporated in the regime. For instance, local institutions can reconsider their policy regarding assessment methods of performance and reward systems. Simply counting the number of publications or performing a cost-benefit analysis cannot capture the potential social and economic impact of a certain project, team, or person. On a national level, departments of ministries developed political agendas or programs, like the ‘national prevention act’ and ‘De Juiste Zorg op de Juiste Plek’, to optimize the contribution of public-private-partnerships in the mission-driven innovation policy of the Top Sector [1].

CONCLUSION AND AMBITIONS

The ability to perform activities of daily live independently throughout the complete perioperative period is not obvious. However, when using an embedded science approach, a patient’s physical functioning throughout the perioperative period can be improved by integrating, evaluating, and ecologically validating pre- and postoperative interventions. To better support citizens in their physical functioning during a major life event, the quadruple helix should combine forces and establish itself deeper in learning communities to create innovations that lead to societal and economic value.

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NOTES

"In der Beschränkung zeigt sich erst der Meister".

- J.W. von Goethe's citaat (1802) -