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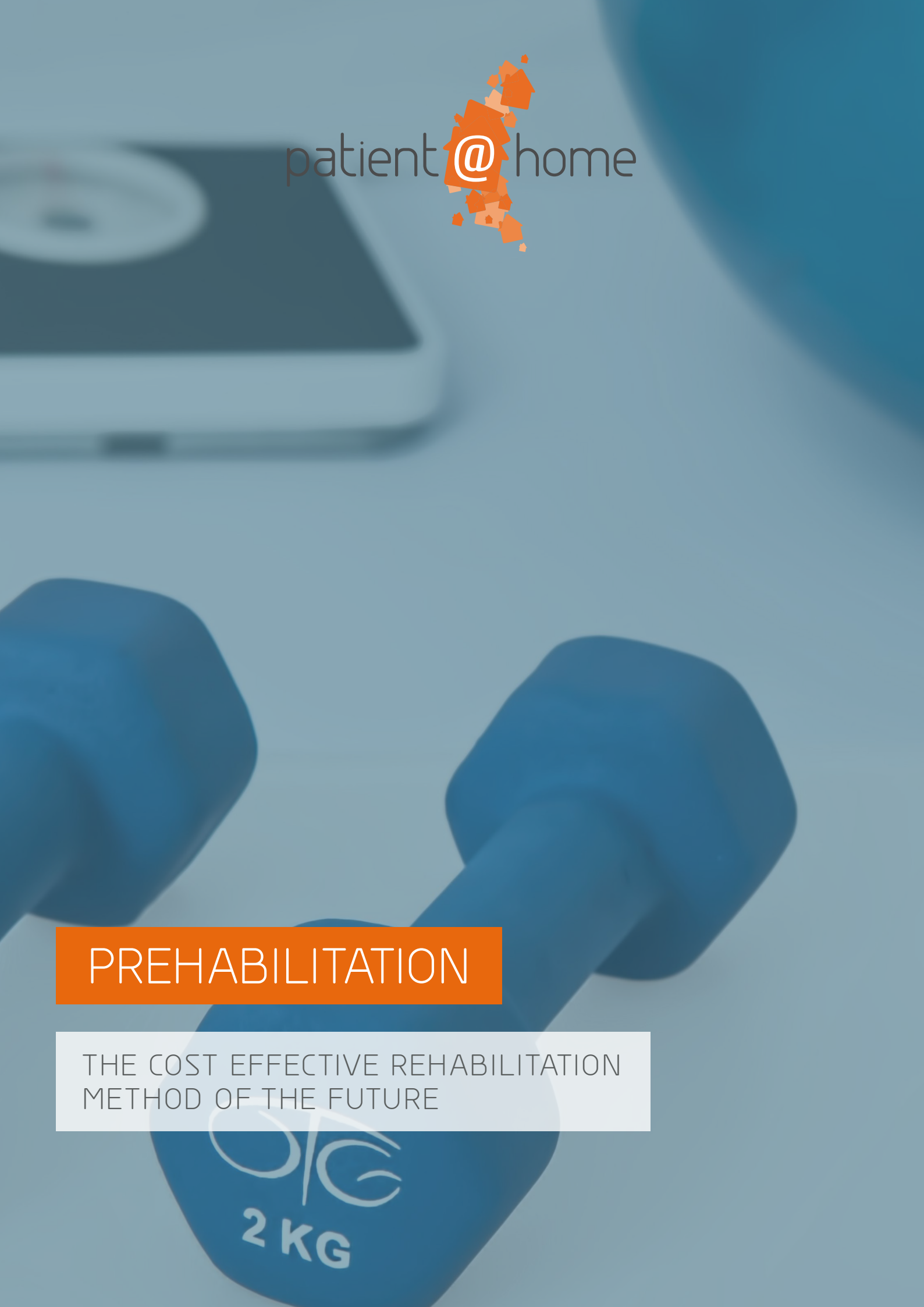

PREHABILITATION

THE COST EFFECTIVE REHABILITATION METHOD OF THE FUTURE

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SUMMARY

Prehabilitation focuses on reducing risks and complications of planned procedures and enabling lifestyle changes for citizens through pre- and post procedure interventions where the healthcare sector and the citizens share the responsibility. Prehabilitation interventions include e.g. physical training, nutritional optimisation, reduction of smoking and alcohol consumption etc. Pioneer examples of prehabilitation are ongoing in Denmark to prove the effect of the concept, however the implementation is still poor.

Some of the challenges are documenting the effect and collaborating across sectors, however there is a general consensus on the potential of prehabilitation, and the gradual integration of healthcare services may aid the implementation of prehabilitation. For companies there are good opportunities for targeting an international prehabilitation market and finding collaboration partners for research and development. The main advice for developing particularly prehabilitation solutions are understanding all of the stakeholders, designing the full solution and service, as well as investing in the long term.

SHORT DEFINITION

The term “prehabilitation”, or “prehab”, is a combination of the words “pre-“ and “rehabilitation”. Prehabilitation concerns a combination of preparational and post-procedure measures to improve the outcome of a planned procedure, such as major surgery or chemotherapy, e.g. pre- and post-operative interventions to enhance the readiness of a patient to undergo a succesful surgery and to improve and accelerate the post-operative recovery.

WHAT IS PREHABILITATION?

Erik Jylling from Danish Regions explains prehabilitation as:

> *"… when a patient or citizen is having some sort of procedure in the healthcare system we immediately go into training mode with the patient, so we or the patient prepare him- or herself to interact with the system in having this treatment. And the easiest way to understand that is when a patient has some kind of arthritis and needs, for example, a knee- or hip replacement. Instead of just waiting four weeks to have that, the patient is immediately involved in a training program to build up their muscles, to build up the ability to train him- or herself and build up the physics to interact with the treatment, in the most suitable way" (Jylling, 2017).*

Prehabilitation expands the concept of treatment to incorporate the full service surrounding a procedure across primary- and secondary care, inline with the trend of Integrated Healthcare Services. In this connection the division of prehabilitation roles and responsibilities between primary- and secondary care are relevant to consider further. Prehabilitation also empowers the citizens and utilises their resources inline with the active role of the patient outlined in Health Consumerism.

The primary focus of prehabilitation is on achieving lifestyle changes and reducing risks and complications.

LIFESTYLE CHANGES

Prehabilitation measures are often lifestyle changes such as physical exercise, nutritional optimisation, and reduction of smoking and alcohol consumption. However, increasingly psychological interventions and medical optimisation are incorporated in prehabilitation programs.

In the case of prehabilitation for surgical patients, the pre-operative period is considered a more appropriate time for interventions such as lifestyle changes, as the patient is likely to be more motivated while awaiting surgery. The post-operative period can often be charaterised by post-surgery tiredness and pain, which can affect the motivation of the patient negatively (Wynter-Blyth & Moorthy, 2017). Prehabilitation presents a potential to utilise the pre-procedure motivation of patients to not only optimise the outcome of the procedure but perhaps even spur a long-term lifestyle change, which may improve the health of the citizen and potentially contribute to prevention, which will be a focus area in the future Danish healthcare sector. Erik Jylling expresses:

"the patient will have a lot more abilities and possibilities to interact with the system and to go for themselves. We will see a system that is much more differentiated according to a way of stratification of patients where we much earlier take action in prevention, and we support the strong patient in doing what he or she wants for themselves, and we support the weak patient much more" (Jylling, 2017).

Long-term lifestyle changes will, however, require continuous support for patients to consolidate their lifestyle change after the recovery period.

REDUCTION OF RISKS AND COMPLICATIONS

Josep Roca argues that prehabilation has a potential impact on several levels; decreasing risk during a procedure, preventing complications of a procedure and reducing the hospital stay in connection with a procedure (Roca, 2017).

According to the McGill Peri Operative Program, which is considered a front-runner within prehabilitation, poor nutritional status and poor physical strength has been shown to "increase the risk of complications after major surgery and prolong recovery". For example, poor physical fitness is associated with higher mortality, postoperative complications, longer hospital stays and healthcare costs (McGill Peri Operative Program). It is therefore hypothesised that improving the nutritional and physical status of a patient prior to surgery could give them a better possibility of withstanding the stress of e.g. surgery (McGill Peri Operative Program). The effects of prehabilitation still need to be investigated and documented further, however some of the first randomised controlled trials, such as 'Personalised Prehabilitation in High-risk Patients Undergoing Elective Major Abdominal Surgery: A Randomized Blinded Controlled Trial' show that "(p)rehabilitation enhanced postoperative clinical outcomes in high-risk candidates for elective major abdominal surgery, which can be explained by the increased aerobic capacity" (Anael Barberan-Garcia et al.).

The potential improvement of procedure success and recovery level and -length has positive implications for both healthcare costs and risk management, which are both of high priority for the Danish healthcare sector in the future. According to Erik Jylling the Danish healthcare sector is interested in "bringing in new technological solutions that could help us with declining the spendings and at the same time give us a better healthcare system" (Jylling, 2017). As early as 2008, on the basis of a randomised controlled test, one of the leading prehabilitation experts in Denmark, Hanne Tønnesen, among others concluded that "(t)he integrated programme of prehabilitation and early rehabilitation in spine surgery is more cost-effective compared to standard care programme alone" (Nielsen, Andreasen, Asmussen, & Tønnesen, 2008).

WHY IS PREHABILITATION RELEVANT?

Prehabilitation as a concept is influenced by the megatrends of democratisation, increased health focus and the paradigm shift in patient groups, while the trends of acceleration and digitalisation enable prehabilitation solutions.

At the same time the demographic change and the increase in chronic diseases lead to more elderly or chronically ill patietns needing to undergo procedures such as major surgery, which prehabilitation can support.

Kevin Dean argues that:

> *"prehabilitation I think has come about because of the desire, not just in the healthcare system, not just to have people getting much better outcomes for their own personal health, but also because poor outcomes from surgical interventions for instance are extremely expensive to correct. If you have to go back into the hospital to get your hip replaced that is a lot of cost" (Dean, 2018).*

Kevin Dean advocates that rehabilitation will lead to better health outcomes for the benefit of all actors.

Kevin Dean and Niels Jørgen Langkilde both further touch upon an important discussion regarding the future 'co-responsibility' between citizens, service providers and society as whole. Can the healthcare system and society as whole afford to provide extensive treatments for patients who do not take their responsibility seriously during the recovery and rehabilitation period (Dean, 2018) and (Langkilde, 2018)? If a citizen expects and demands a certain treatment from their service provider, can the service provider not make demands in return, argueing that the treatment will not be effective if you do not comply?

HOW IS PREHABILIATION DONE?

Venetia Wynter-Blyth, Consultant Nurse, and Krishna Moorthy, Consultant Surgeon, from the BMJ award-winning PREPARE for surgery team at Imperial College Healthcare, employ a marathon analogy to argue the relevance of prehabilitation. Their argument in a British Medical Journal editorial from 8th August 2017 is that "major surgery is like running a marathon – and both require training". As they argue, "training for sport includes mental preparation and confidence building to maintain a positive attitude and self motivation" in addition to nutrition and exercise (Wynter-Blyth & Moorthy, 2017), and the same could be said for major surgery and other major procedures.

As previously mentioned, the lifestyle changes incorporated in prehabilitation measures are especially focused on physical training, nutritional intervention, reduction of smoking and alcohol consumption, and increasingly psychological intervention and medical optimisation;

Physical training can increase strength and aerobic capacity so that a patient has more strength and energy for going through the procedure and for the post-procedure recovery.

Nutritional intervention concerns optimisation of the nutritional intake of a patient prior to a procedure. Diseases can affect the nutritional status of patients, and undernourishment can pose higher risks in procedures such as major surgery. Nutritional intervention aims to optimise the nutrient stores prior to an operation to compensate for the catabolic response of the procedure and prevent loss of lean body mass (McGill Peri Operative Program).

Smoking and alcohol consumption can strongly influence the general health of a patient, their capacity to handle the stress of a procedure and their long-term state of health. Hanne Tønnesen explains that research has e.g. "identified that the threshold for risky drinking is about 2 drinks per day, so it is really low so do not drink too much if you are planning to undergo surgery" (Hanne Tønnesen, 2018) .

Psychological intervention can include anxiety and stress reduction strategies as well as breathing and relaxation techniques to optimise the mental readiness for a procedure and increase the motivation to actively participate in the recovery process and adopt a healthier lifestyle longterm (McGill Peri Operative Program).

Medical optimisation focuses on adjusting the intake of medicine and monitoring vital signs in order to achieve the optimal status for procedures such as major surgery (McGill Peri Operative Program).

Which interventions are incorporated in a prehabilitation programme depend on the type of procedure and on the individual patient. Venetia

Wynter-Blyth, Consultant Nurse, and Krishna Moorthy from the PREPARE for surgery team argue that one of the main success factors is whether the prehabilitation programme is personalised (Wynter-Blyth & Moorthy, 2017). They also argue that "(p)rehabilitation represents a shift away from the impairment driven, reactive model of care towards a proactive approach that enables patients to become active participant in their care" (Wynter-Blyth & Moorthy, 2017) . In other words, the patient has an active role in prehabilitation and is given the opportunity to and empowered to contribute to managing their own healthcare, and the success of the prehabilitation interventions therefore also depend on the motivation and capabilities of the patient.

Hanne Tønnesen explains:

> *"it depends of the needs of the individual patients. It means that if you have a patient who is not physically active, a patient overweight or malnourished or a patient drinking too much alcohol, a patient smoking etc. then there is a huge effect by using quit-smoking programs or alcohol intervention programs or physical activity exercises. Better nutrition etc., it has a huge influence, absolutely, but it has to be in relation to the patient's needs. And today we know that it is not that everybody should have everything. You have to adapt this prehabilitation program to the needs that the patients themselves have … So we have to be better at identifying those with these needs" (Hanne Tønnesen, 2018).*

The personalised approach and support of the active role of the patient is inline with the general trends of personalisation and the new role of the patient in Danish healthcare described in Integrated Healthcare Services and Health Consumerism.

PREHABILITATION IN THE DANISH HEALTHCARE SECTOR

TODAY

Post-procedure rehabilitation has long been acknowledged for its effect on the recovery of e.g. surgical patients. Prehabilitation, on the other hand, is still not used widely in Denmark. However, clinical trials are being carried out to prove the viability and effect of prehabilitation, e.g. by Hanne Tønnesen, particularly in improving the outcome of orthopedic surgery, high-risk surgery and cancer treatment. There are also strong pioneer examples such as the Municipality of Copenhagen, which, as of June 2017, offer free prehabilitation for patients with a planned knee- , shoulder-, chest- or abdominal surgery and who are less physically active, smoke on a daily basis or have heavy alcohol consumption ('Præhabilitering – nyt tilbud til patienter, der skal opereres').

These pioneer efforts indicate an increasing focus on the potential of prehabilitation as an effective tool to reduce procedure risks and hospital stays and speed up the process of patients returning to general health, to their home and back to work. All of which represent cost reduction potential for the healthcare sector and society as a whole.

However, Denmark still has quite a way to go. Hanne Tønnesen explains:

> *"the brilliant thing about Denmark is that we have a lot of knowledge, about what we should do. We have done several studies, given the high amount of evidence and the randomised controlled trials. So we know about the effect, we know about the patient preferences, we know about the staff competences needed to use prehabilitation daily in clinical life. However, the implementation of it is really poor. We did a study some years ago where we showed that only 5-10 % of people with COPD (Chronic Obstructive Pulmonary Disease) actually had rehabilitation programs eventhough it is recommended for almost all people with COPD. And that is just rehabilitation and if you then go proactively for the prehabilitation, then it is definitely not used in a very high degree" (Hanne Tønnesen, 2018).*

IN 2025

Although prehabilitation has not been implemented widely in Denmark yet, there is a general consensus that we will see more prehabilitation in the future. When asked about the future potential of prehabilitation, Kevin Dean argues that "educational services has been around for a while and I think they will become more and more pervasive" (Dean, 2018).

Erik Jylling believes that "there are very good opportunities to take prehab more systematically into our healthcare system" and " there is an increasing understanding in the municipalities for the importance of rehab con-

cerning much more intensive training with the patient, for a longer time, in the perspective that the patient will benefit from that and be more self-empowered afterwards, and therefore not needing the municipality services. And I think … realising that in the municipalities is a good platform for also introducing prehab in a more systematic way" (Jylling, 2017).

Inline with Integrated Healthcare Services in general, the division of responsibilities and roles of the municipal and regional healthcare providers is an ongoing process.

Hanne Tønnesen argues that prehabilitation programs have a huge effect, for example:

> *"if you quit smoking before surgery, quit risky drinking then you can half the complication after surgery. If you are overweight and if you are physically inactive you can reduce it with about 20%, so it is a lot. Usually when we talk about surgery and talk about complication, if you introduce new programs, introduce surgical methods or something like that then you might reduce it with a few percentiles. So reducing it with 20 – 50 % is amazing. So it has a huge potential for effect and we should absolutely use it" (Hanne Tønnesen, 2018).*

Hanne Tønnesen has made calculations that 8,000 to 10,000 Euro can be saved by reducing smoking-related complications per patient. In her opinion it is therefore "not a question about who should pay for prehabilitation, when it comes to surgery it is more a question about how should we spend the money that we save when we are doing this" (Hanne Tønnesen, 2018).

CHALLENGES FOR PREHABILITATION

As previously mentioned, despite the expected benefits of prehabilitation, it is still not widely used and implemented. Hanne Tønnesen says:

> *"we know about the effect, we know about the patient preferences, we know about the staff competences needed to use prehabilitation daily in clinical life. However the implementation of it is really poor … There are no technical challenges that could not be overcome here. But there might be some political approaches or challenges that should be overcome as well. I think it is on its way, it is improving, but we have a lot of potential that is not used today. And that is a pity, because the patient wants it, and we have a lot of effect. So it is just to step forward" (Hanne Tønnesen, 2018).*

So why has prehabilitation not been implemented widely yet? The challenges for implementing prehabilitation are multifaceted. Some of the main challenges are documentation of effect, cross-sectorial collaboration and co-responsibility.

DOCUMENTATION OF EFFECT

As a new additional service for the citizens, prehabilitation represents an extra cost in comparison to procedures without prehabilitation. There is therefore a need for investment in prehabilitation. As with other new services in the healthcare sector, the decision regarding this investment will be dependent on evidence the effects that can be achieved. Peder Jest explains:

> *"it is very very important that it is evidence-based as far as it is possible, because that is what the physicians and others expect, they will not use systems that are not evidence-based. It should be at least as good as what we are doing today … and if it could be better, it is even better for us" (Jest, 2018).*

Proving the effects of prehabilitation through e.g. randomised controlled tests is still ongoing.

Josep Roca argues that:

> *"prehabilitation, including a combination of training, lifestyle changes, promotional physical activity, stress management and nutrition, we have demonstrated through randomised control trials its efficacy. This is a typical approach (to show efficacy). Our problem is then to show effectiveness when you move from the randomised controlled trial to the real world, and to show in addition that it is cost-efficient" (Roca, 2017).*

CROSS-SECTORIAL COLLABORATION

The introduction of a new service, and particularly one that spans across multiple sectors, will demand a reorganisation of the services and workflows within each involved organisation and the cooperation between them. It will be imperative to work on how prehabilitation is integrated into existing workflows, and who does what. According to Erik Jylling, the intersectorial nature of prehabiliation may present challenges for the implementation, as intersectorial collaboration in general is still challenging (Erik Jylling, 2017). Although he thinks there are great possibilities for "introducting prehab more systematically in Denmark", he believes that:

> *"the large problem is probably to make employees and planners in regions, hospitals and municipalities look up and see themselves as an integrated system in a continuum of care for the single patient and not as fragmented elements that are only taken down from the shelf when it is needed" (Jylling, 2017).*

Erik Jylling explains that it will of course:

> *"demand that the municipality knows what happens to the patient and what is planned for the patient so that the municipality has the ability to build in prehab at the right time. So, at the time the General Practitioner, for example, dispatches a patient to the hospital system the municipality should immediately know that this patient is going to have this or that treatment, and therefore we intervene or upscale our training with a patient immediately" (Jylling, 2017).*

The general movement towards Integrated Healthcare Services may in turn improve the conditions for prehabilitation.

CO-RESPONSIBILITY

Prehabilitation utilises the expected inner motivation of patients undergoing a major procedure and enables citizens to play an active part in the success of their procedure and recovery. As with prevention, motivating users to actively and consistently do prehabilitation, if they cannot see the immediate results throughout the process, could be a major challenge.

The relevant question may be how the responsibility for health, and prehabilitation interventions, should be shared or split between the citizens themselves and the public healthcare sector. And what role does the public healthcare sector have in enabling, motivating or demanding the individual health interventions of the citizen?

OPPORTUNITIES FOR COMPANIES

The prehabilitation trend in the Danish Healthcare Sector offers the following opportunities for companies developing solutions for prehabilitation.

DIFFERENT INTERVENTION OPPORTUNITIES

Prehabilitation can include different types of intervention for different procedures and patient types. Solutions for prehabilitation would benefit from targeting or encompassing the different aspects and considerations for different intervention types listed in the article 'Role of Prehabilitation in Patients Undergoing Cancer Surgeries':

- Structured exercise protocols
- Nutritional optimisation, e.g. supplementation
- Relaxation techniques and coping strategies
- Respiratory optimisation, e.g. smoking cessation, breathing exercises, incentive spirometry and hydration
- Cardiovascular optimisation, e.g. medical optimisation for disease, lifestyle modifications, smoking and alcohol cessation
- Anemia correction, e.g. iron therapy (Ahuja D, Garg R, 2017).

INTERNATIONAL MARKET POTENTIAL

As prehabilitation is up-and-coming internationally prehabilitation solutions may have a global market potential, which is not yet filled with competitors, and which likely to increase in the future. Hanne Tønnesen argues that "internationally there is a big variety in how it is used and who is getting it. There is no doubt that the potential here is also huge. And not used to a very high degree" (Hanne Tønnesen, 2018).

ENTER A RESEARCH PROJECT

As the prehabilitation field is not very well-documented yet, research is required. This means that companies developing prehabilitation solutions may find it easier to find research partners and create collaboration project to mature theirsolution.

EMPOWERMENT OF CITIZENS

Prehabilitation presents an opportunity for citizens to take an active part in their own recovery. Prehabilitation solutions can enable citizens, who are able and willing, to play an active part and have an effect on their own health, especially considering the trend of Health Consumerism in the Danish Healthcare Sector.

Hanne Tønnesen argues that most people are interested in prehabilitation: “So from our interview study we know that the patient wants it. They all want to have the offer of these kinds of prehabillitation programs” (Hanne Tønnesen, 2018) .

Companies that can develop solutions that empower citizens may find a relevant market within prehabilitation.

FOCUS ON LONGTERM LIFESTYLE CHANGE

Solutions that support longterm lifestyle changes that go beyond procedure-related prehabilitation and enters the citizen’s daily life may contribute to prevention of future complications and lifestyle diseases, which will benefit the citizens, healthcare sector and society alike.

SUPPORT THE SOCIOECONOMICALLY DISADVANTAGED

Solutions that can support socioeconomically disadvantaged citizens to participate in prehabilitation interventions will fulfill a need for the health sector to provide equal healthcare opportunities.

BARRIERS FOR COMPANIES

There are, however, also some barriers for prehabilitation solutions to overcome:

RESEARCH AND DOCUMENTATION IS SCARCE

As the prehabilitation field is not as consolidated and documented yet, the scarcity of research and documentation may lead to resistance for immediate sale of prehabilitation solutions. Research and documentation will probably be necessary before a sale can be realised. Josep Roca explains that:

> *"the problem is that both the financial and cultural drivers are very strong, but we in the school of medicine teach traditional medicine. So, the inertia, meaning the time between the design of a new healthcare system, a new way to approach disease and to do the research and practice, is too long. It takes too much time" (Roca, 2017).*

CROSS-SECTOR COMPLEXITY

As with rehabilitation, prehabilitation interventions will have a cross-sectorial nature, in that the actual procedures, such as major surgery, are carried out by the hospitals, whereas the prehabilitation interventions are done in the homes of the citizens, and as such concern primary care. As described in Integrated Healthcare Services, the coordination between hospitals and primary care can be a challenging field. Companies would therefore benefit from understanding the complexity of stakeholders, systems, financial structures and processes. Significant disadvantages or changes for one stakeholder may necessitate a political or management decision across sectors.

CONSIDERATIONS FOR COMPANIES

When developing solutions for healthcare, particularly solutions that handle personal data, the following aspects will be relevant to consider.

GENERAL DATA PROTECTION REGULATION (GDPR)

In May 2018 the General Data Protection Directive from EU (GDPR) will enter into force in the EU (European Council, 2016). The purpose of the directive is to strengthen citizens' fundamental rights when it comes to data, privacy and digitalisation – but also to simplify rules for companies and thereby facilitate growth. Some of the more noteworthy changes enforced by the directive are the possibilities of issuing fines amounting to up to 4% of a company's annual turnover.

In order to adhere to the GDPR, companies may look at the Guidelines for Cybersecurity (ISO 27032).

CONSENT

The regulation regarding data subject consent has been further strengthened and clarified. Consent must be explicit and the citizen must be clearly informed of the precise and defined purpose of data collection. Furthermore the citizen has the right to revoke consent. If consent is revoked the data must be deleted and proof that it has taken place presented to the citizen. This will affect all companies handling data pertaining to the citizen's health.

DATA PORTABILITY

Data portability is a new topic introduced by the GDPR. With GDPR the citizen will have the right to data portability. This means that if you collect personal data the citizen has the right to receive the personal data concerning him or her in a structured, commonly used and machine-readable format. They also have the right to transmit those data to another organisation that collects data about the citizen. The purpose of this obligation is to limit the number of times citizens have to answer questions about the same subject matter, e.g. age, height, gender etc.

This is particularly interesting from a healthcare perspective because data might be required to be shared across different organisations in the healthcare sector to a much greater extent than they are today. This might also prove a new business opportunity for companies, since there may be a whole new market emerging for solutions to support data portability, e.g. by providing system integration or sharing information between different IT systems.

EUROPEAN MEDICAL DEVICES DIRECTIVES

In addition to the more general GDPR directive, an updated directive on Medical Devices will enter into force in the spring of 2020 and 2022. The two directives (EU) 2017/745 "MDR" & EU 2017/746 "IVDR" - (European Parliament & European Council, 2017a, 2017b) heavily regulate what is defined as medical devices, and how such devices can be tested and used within the boundaries of the EU. This is central for especially Data Analytics and Smart Health Technologies. 'Medical purpose' is defined as any type of diagnosis, prevention, monitoring or treatment or alleviation of disease or disability. The vast majority of devices which collect health information are likely to be considered medical devices, even if they do not process or analyse the data. Companies operating within the domain of health should proactively investigate compliance with these regulations and adjust development processes accordingly.

ETHICAL GUIDELINES

Bringing technology into the sphere of healthcare services brings with it relevant ethical considerations. The Health Innovation Centre of Southern Denmark has developed two videos that illustrate the expectations and challenges that may arise when new technology meets the healthcare sector. The videos focus on the perspectives of the patients at home and the clinicians working across sectors, respectively. Companies may consider these ethical aspects in their development process.

ADVICE FOR COMPANIES

Companies developing solutions for prehabilitation in the Danish healthcare sector of 2025 should particularly consider the following:

UNDERSTAND STAKEHOLDERS AND INCENTIVES ACROSS SECTORS

As with rehabilitation, prehabilitation interventions will have a cross-sectorial nature, in that the actual procedures, such as major surgery, are carried out by the hospitals, whereas the prehabilitation interventions are done in the homes of the citizens, and as such concern primary care. As described in Integrated Healthcare Services, the coordination between hospitals and primary care can be a challenging field. Companies would therefore benefit from understanding the complexity of stakeholders, and the pros and cons that their solution will present for each stakeholder. Significant disadvantages or changes for one stakeholder may necessitate a political or management decision across sectors.

As Hanne Tønnesen puts it:

> *"Money and business cases can convince managers and insurance companies etc. to do this implementation, especially if they see the money flow themselves. If you see it go to another box then you might not have the same interest" (Hanne Tønnesen, 2018).*

Selling solutions to the public sector can be a lengthy and complex process due to the stakeholder complexity and procurement processes. In this connection Helle Aarøe Nissen underlines the importance of the promotion of a solution and explains that:

> *"some firms get to know how the system actually works and they get to know that in the healthcare system there are lot of different actors who influence the decision to buy a new innovative solution. So some of the firms who succeed to commercialise solutions across hospitals and regions, they actually take into account that there are a lot of different stakeholders at different levels within the healthcare system, and they use that when they promote their innovative solutions. So that they remember to take into account the different needs and the different values which different actors want to have taken into account" (Nissen, 2017).*

DESIGN THE FULL SOLUTION

Adapting new prehabilitation programs may fundamentally change the related workflows and service delivery across sectors. It is essential that companies understand the impact that their solution has on workflows, patient pathways etc. Hal Wolf argues that:

> *"Technology overall is never the answer! In any situation. In any industry. In any moment in time. You know, technology is a component of a full answer" (Wolf, 2018).*

One strategy for ensuring that a solution can be integrated in the daily operations could be to collaborate with the public customer in designing new context-specific workflows across sectors. According to Christian Bason, CEO of Danish Design Center, companies can use service design as a force of change from a product- to service oriented business strategy in order to survive in a highly competitive market that demands user satisfaction. In order to succeed companies must challenge their assumptions regarding their company and solution and take their point of departure in the user perspective as a motivating force for change. When taking this strategic approach companies can drive digital transformation through new products and services (Bason, 2017). Chesbrough explains how companies in any industry can make the shift from product- to service-centric thinking, from closed to open innovation where co-creating with users enables sustainable business models that drive continuous value creation for users. He also pinpoints that an open service innovation approach must be applied because the healthcare system is a highly connected economy (Chesbrough, 2011).

Service design is active planning and organisation of people, infrastructure, communications, media and services. Service design therefore contributes to good coherent service experiences. Service design helps to read, understand and identify users' needs, expectations, and dreams, so you have a solid foundation for developing new workflows, services and products that actually work. Service design puts the user at the center, whether they be staff, patients or relatives. It is absolutely essential that those who use the solution should also help define it. User involvement ensures that you solve the real issues. Not only what the supposed problem or need is. Service design gives you a fresh look into your own organization. It's a set of fresh eyes that challenges your habits and what you usually do, which has become a part of everyday life and seems almost invisible to you (Schneider & Stickdorn).

Hal Wolf underlines that integration of technology into the daily operations is imperative:

> *"So if we ever continue to hang our expectations on some silver bullet that is created by technology, it just doesn't work that way. It is how you integrate the technology into actual functional care and daily usage (…) There are thousands of technologies available, they mean nothing until you load them into your own domain and begin to use them as a part of how you deliver care" (Wolf, 2018).*

INVEST IN THE LONG TERM

Prehabilitation is still a fairly new field, which is not adopted consistently and systematically in healthcare yet, neither internationally nor in Denmark. Companies should therefore expect the development and sale of prehabilitation solutions to involve a longterm strategy and a research foundation. The longterm strategy would benefit from project collaborations, in which the technology is matured and documented through continuous user involvement.

WORK WITH MOTIVATIONAL ELEMENTS

Prehabilitation is dependent on the motivation and active participation of the citizens/patients. Solutions that include (personal) mentoring or coaching based on monitoring and presenting progress and activity, either as embedded functions in the solutions or integrated with healthcare personnel, who use the solution to monitor and communicate with the citizen/patient in a coach-like role, may be more likely to encourage behavioural change and achieve results. Developing solutions that are attractive enough for the citizens to want to use them saves the healthcare sector the efforts of convincing, encouraging, or potentially even forcing, people to use them. For patients/citizens to take an active role in their care experience and choose their own care alternatives, companies could build in motivational aspect.

Hanne Tønnesen argues:

> *"It is a natural thing to include all the new developments into prehabilitation. I mean if you develop some new tools that can make it easier, make it fun to exercise, if you make some digital tools to support changing lifestyle life habits … And every time you develop new treatments, new interventions, new ways of living, we should absolutely think about how does this affect my health in general and does this effect our patients, can we use this, and I think the intelligent digital solutions are huge way forward" (Hanne Tønnesen, 2018).*

Motivational Elements, such as individualised/personalised solutions, continuum of care perspectives, flexibility, instant gratification etc. are relevant to consider, when companies aim to make solutions attractive enough to motivate users to participate actively in their own health. Gamification and game theory, amongst others, can help to conceptualise potential solutions, as these methods have the ability to activate patients and make them accountable for their health choices (Deloitte, 2016). Peder Jest agrees: "what we see in the play and the game industry are also possible to use in the healthcare sector" (Jest, 2018).

EMPOWER PEOPLE, TO COUNTERACT POLARISATION

Not all citizens will have the same capabilities to engage in prehabilitation interventions, which could affect equality in healthcare. Developers of prehabilitation solutions should consider how and to what extent their solution can support those who do not have the capabilities themselves.

GENERAL ADVICE

In their prioritisation of future research and development activities, companies that develop solutions for the Danish healthcare sector of 2025 are adviced to consider how to:

- Solve the User's Needs
- Co-Create with Users and Stakeholders
- Understand and Document the Value of their Solutions
- Contribute to Implementation

SOLVE THE USERS' NEEDS

> *"It is not technology for the technology's sake; it is for the patient's sake we are working!" (Jest, 2018).*

Peder Jest underlines that serving the patients is the primary purpose for the healthcare system. The development of new solutions should be centered around the users and their needs.

UNDERSTAND THE NEEDS AND CHALLENGES OF THE USERS

The users are the experts! A common challenge for development of successful solutions is lack of knowledge about the users. Investing the time and resources in identifying and understanding the needs and challenges of the future users of your solutions may be a worthwhile investment.

Erik Jylling says:

> *"Just bringing in new solutions and declaring that innovation will do it is not enough for a public healthcare system. Who is against innovation? Nobody! But we need to have solutions that can help us running the system. And we have to have the ability to assess that the solutions are also in favour of being integrated in the system. So it should benefit the patient, the outcome, and it should also benefit the spendings of the public economy" (Jylling, 2017).*

The healthcare sector is interested in solutions that match their needs and challenges.

Hal Wolf underlines:

> *"Companies have got to figure out how to help integrate and develop innovations that are not just interesting, that can be utilised by the health systems themselves. And that is the big challenge that companies have, it is not about simply developing (…) technology. Companies that are developing technology for technology's sake*

will not win!" (Wolf, 2018).

For companies it may be relevant to look into the fields of user-centred design and -innovation, anthropology and design. These fields may offer approaches and essential tools to uncovering unrecognised needs and transforming these insights into valuable solutions.

DESIGN FOR USABILITY

The technological development offers many opportunities for new solutions, and there is undoubtedly a vast national and international market for healthcare solutions (Jylling, 2017), however it is essential that companies and developers focus their efforts on developing solutions that address and solve the actual needs and challenges of the healthcare sector and their daily operations.

Hal Wolf goes as far as to say:

> *"Technology by itself without the process piece and the people piece that sits behind it, it's useless, it means nothing" (Wolf, 2018).*

When designing new technologies it will be important to accommodate the users and design for user preferences and capabilities. John Christiansen argues that:

> *"for new technologies, in the future I (nurse) will not need to educate myself for new technologies but technologies will be ready to incorporate us all, whoever I am, without needing to read piles of manuals but that it will be more intuitive" (Christiansen, 2017).*

He continues:

> *"if systems are so complicated that we have to educate ourselves to understand the systems that we use for reporting, then maybe we are not the ones who need to be educated, maybe it is the way we think systems that is not intuitive enough" (Christiansen, 2017).*

In other words, technologies should be adjusted to fit the capabilities of the users and not the other way around.

CO-CREATE WITH USERS AND STAKEHOLDERS

POOL MULTIDISCIPLINARY RESOURCES IN OPEN

INNOVATION COLLABORATIONS

There is a general trend towards open innovation, in the acknowledgement that the benefits of pooling resources and knowledge allow 1 plus 1 to equal 3.

Peter Watts argues the importance of a multidisciplinary approach. He argues that companies:

> *"need to get a balance of skills (…) My team is made up of technical people, medical people, financial, legal, and I think that healthcare is so complicated, it needs understanding, it needs empathy, it needs lots of different skillsets. (…) I've been in technology all of my life, and I've been very lucky to see many good things happening in that time. And I'm very aware that technology isn't the solution to anything, it's the use of it that's the value. And you need smart people to do that, and you need multi-discipline people" (Watts, 2017).*

Carsten Obel agrees that multidisciplinary collaboration is a good strategy:

> *"You should work together with people who have quite as different backgrounds as possible and engage in as many collaborative networks as possible, but still have the focus on the citizen and the value creation in focus" (Obel, 2017)*

A company should not be an island in itself but acknowledge that others may have knowledge and expertise that is worth utilising to accelerate and improve development of new innovation. Especially large corporations could benefit from collaborating with SMEs/ smaller companies to a greater extent, by e.g. auctioning their needs for small companies to develop on (Munksgaard, Johnson, & Patterson, 2015). This is both the fastest process as well as the most cost-effective in the long run. Both large and smaller companies can utilise their best skills, which are e.g. the enthusiasm and ideating skills of small, entrepreneurial companies and the grounded strategy and long experience of larger corporations, which also often have more conservative professions and less resources for experimentation and new thinking (Nissen, 2017).

Peter Watts agrees that large companies and smaller companies could benefit from collaborating:

> *"Big companies can explain their roadmap and where they are going and what they need, and the benefit to the industry is*

fantastic. They may have big money for R&D but they don't always have the time and they don't always have the enthusiasm that small companies have. So bringing those together I think, is a real big key, and I think the role of government is really important too" (Watts, 2017).

Mature Solutions through Public-Private Collaboration

There is a growing general interest from public partners in Scandinavia in opening up and collaborating with private partners in Public-Private Partnerships (PPPs), Public-Private Innovation Partnerships (PPIs) etc. This openness enables companies to get access to and collaborate with the public healthcare sector (Nissen, 2017).Collaboration with public partners presents a significant opportunity for private companies. However, it is important that companies are aware that the healthcare system is a 'supertanker'. Things take time; e.g. rules and regulations, particularly within public procurement, are time-consuming. Quick wins are not possible and companies should expect a long lead time from the first dialogue to a contract (Øllgaard, riis, Boding-Jensen, & Garsdal, 2016). This timespan may clash with the shortterm focus of many companies, particularly SMEs. Companies are advised to invest in the long term when collaborating with public partners.

The Capital Region of Denmark argues that bidding on a tender does not start with writing the bid. They advice companies to: "Communicate with the municipalities leading up to a tender and influence the process. Prioritise which tenders you want to invest in" (Øllgaard et al., 2016). The primary focus and outcome of public-private collaborations is not sales/procurement. Helle Nissen argues that from a company perspective collaborations are a long-term strategy to achieve a) insights into needs and organisational structures, b) further needs-based development of a solution, and c) networks with relevant stakeholders (Nissen, 2017), all of which can influence future sales potential for a solution.

FAIL AND LEARN EARLY THROUGH USER TESTING

Fail fast, succeed sooner! A prototype is not a tool to prove that you are right. It is a tool to help you learn. User testing is an essential part of innovation processes within healthcare. Getting new insights and knowledge about stakeholders through testing and co-creation can ensure that a solution meets the user needs and demands.

The general rule of thumb is to test early, fail fast and learn cheaply. Helle Nissen recommends that companies: "test it! Have different kind of user groups to test it. Not only focus on one user group, but have different kind of stakeholders test the solution. And have a dialogue also with different kinds of stakeholders to understand what they value, and then you can

adapt the solution so that it fits these kinds of values among the different stakeholders" (Nissen, 2017).

Carsten Obel argues that the possibilities of testing is special and very valuable for Denmark:

> *"Testing approves that it actually works and gives an 'approved in Denmark' sign. So I think this is a great opportunity that health providers have in Denmark, because this doesn't exist in any other place in the world, except for the Nordic Countries" (Obel, 2017).*

John Christiansen believes that there are so many needs in the healthcare system that new solutions can address, however companies need to prepare to fail and learn, and they need to investigate the market:

> *"The challenges will be having the energy and courage to fail many times and having an overview of whether what one is developing is already out there" (Christiansen, 2017).*

SAVE TIME THROUGH ESTABLISHED CHANNELS

Each public region in Denmark has established a 'single-point-of-entry' for the industry (En indgang), similar to the single-point-of-entry for organising collaboration between public and private partners that many municipalities have. These access-points are specialised in public-private collaboration and matchmaking. They have insights into which departments and health professionals may be interested in collaborating within a specific field as well as access to test facilities and clinical trials, saving companies the time-consuming task of knocking on multiple doors.

UNDERSTAND AND DOCUMENT THE VALUE OF SOLUTIONS

"Some firms get to know how the system actually works and they get to know that in the healthcare system there are lot of different actors who influence the decision to buy a new innovative solution. So some of the firms who succeed to commercialise solutions across hospitals and regions, they actually take into account that there are a lot of different stakeholders at different levels within the healthcare system, and they use that when they promote their innovative solutions. So that they remember to take into account the different needs and the different values which different actors want to have taken into account" (Nissen, 2017).

Selling solutions to the public sector can be a lengthy and complex process due to the stakeholder complexity and procurement processes. It is important to understand the value of a solution for the relevant stakeholders, and to document this value.

Ensure Business Model Agility and Adapt to Diverse Contexts

It is important to be aware of the direction that incentive- and payment structures are moving in Denmark and how it will affect your solution. Company business models should contain the flexibility and agility to incorporate this development. This agility is even more necessary for companies aiming to bring their solutions to international markets where the financial structures are considerably different.

Erik Jylling argues the relevance of ensuring scalability of your solution:

> *"They have to take into account that the product should be scalable, and the product should bring us not only new products but it should bring us solutions that helps us solve the big fundamental structural problems that we see in the healthcare system, not only in Denmark but internationally, today and especially in the years to come" (Jylling, 2017).*

As previously described in Fail and Learn Early through User Testing there are many opportunities for testing solutions in a Danish context. It is, however, important to be aware that testing a solution in e.g. one hospital department with a few healthcare personnel representatives is unlikely to cover the organisational diversity across all Danish hospitals. Even less so across international hospitals.

Companies should develop solutions that incorporate appropriate flexibility to accommodate the diversity of organisational needs, nationally as well as internationally. According to Helle Nissen some "firms as a strategy choose to engage in new collaborations (Public-private partnerships) in order to improve their product or in order to adapt it to a specific context" (Nissen, 2017). She argues that:

> *"firms have to interact with these different actors in some sort of way in order to adapt the development of their solutions, so they fit with the different kinds of users in the healthcare system" (Nissen, 2017).*

Prove and Document the Value

Helle Nissen underlines the importance of understanding your stakeholders and procurement processes (Nissen, 2017). Healthcare budgets are under increasing pressure and the healthcare sector is interested in the proven value and effect of solutions.

Erik Jylling argues that: "companies that are concerned about developing new solutions for the Danish healthcare system should take into account that the economical pressure for public economy now and in the years to come will be quite substantial" (Erik Jylling, 2017).

He underlines that the healthcare sector "have to have the ability to assess

that the solutions are also in favour of being integrated in the system. So it should benefit the patient, the outcome, and it should also benefit the spendings of the public economy“ (Jylling, 2017).

This necessitates not only an understanding of the value of the solution but also evidence of this value.

Business cases and technology assessments are often required prior to a sale to a public partner. Business case processes can be both time- and resource consuming. Therefore it is relevant to consider to what extent the results, criteria, quality and validity of business case results are transferrable to other settings and customers. Companies should take into account that a public partner will usually have a primary interest in business case results for their own specific context, so it will, as a general rule, be the responsibility of the company to ensure the focus on transferability of results.

UTILISE POLITICAL DIRECTIONS AND FUNDING OPPORTUNITIES

The Danish healthcare sector is mainly governed by politicians. Continuously assessing and following the political and public opinion, which is dynamic, may enable companies to utilise e.g. political waves to strategically time initiatives and communication in favour of the solution. It is also relevant to keep an eye on and utilise the many funding possibilities for innovation.

CONTRIBUTE TO IMPLEMENTATION

It is crucial to be aware of the importance of implementing solutions. Peder Jest underlines:

> *“You can invent anything and you can find evidence for everything but if you cannot implement it, it doesn’t matter” (Jest, 2018).*

Like many others, Hal Wolf argues that implementation is much harder than the actual technology development:

> *“Well, I think the implementation of any technology at the hospital level, moving into the next generation of healthcare, just like in any industry, always comes down to three basic things; it’s people it’s process and it’s technology! (…) the technology inevitably is the easiest part. It is changing the processes necessary to take care, or utilise the technologies, and then the cultural components of how to integrate them into daily work habits, and our expectations.”*

Solutions that support the healthcare sector and contribute to implementation may have an advantage.

Support and Co-Create Implementation Processes

Jørgen Løkkegaard, CEO, The Danish Technological institute and Innovation Manager in Patient@home states in Mandagmorgen:

> *"Our experience is that technology represents only 20 % of the task with successful implementation, while the culture of technology accounts for 80 %" ('Jørgen Løkkegaard i Mandag Morgen nr. 35, 9.10.2017').*

It is a common challenge in the public sector that some new solutions, which have been procured to save time and increase quality, are not fully implemented or adopted. This affects both the public sector, who do not fully realise the intended benefits of the solution, and the company, for whom the case becomes a poor reference.

It is clear that implementation is important and difficult (Wolf, 2018). Companies that are able and willing to support the public sector and co-create a strong implementation process for their solution are more likely to achieve a mutually beneficial outcome for all stakeholders.

Design the Full Solution

> *"Technology overall is never the answer! In any situation. In any industry. In any moment in time. You know, technology is a component of a full answer" (Wolf, 2018).*

Hal Wolf makes it crystal clear that technology is just one part of the puzzle; a much bigger part of that puzzle is the full service design. According to Hal Wolf the value of new solutions diminishes if the processes and culture are not changed (Wolf, 2018). According to Christian Bason, CEO at Danish Design Center, in order to succeed companies must challenge their assumptions regarding their company and solution and take their point of departure in the user perspective as a motivating force for change (Bason, 2017).

Service design is active planning and organisation of people, infrastructure, communications, media and services. Service design contributes to good coherent service experiences. It helps to read, understand and identify users' needs and expectations so that you have a solid foundation for developing new workflows, services and products that actually work. Service design puts the user at the centre and gives you a fresh look into your own organisation, its habits and challenges (Schneider & Stickdorn).

Designing the full solution is therefore about combining the technology and service components into an integrated solution, and Hal Wolf underlines that what matters is integration of a technology into the daily operations and workflows: "There are thousands of technologies available, they mean nothing until you load them into your own domain and begin to use them as a part of how you deliver care" (Wolf, 2018).

VALUES AND RISKS OF PREHABILITATION

Prehabilitation may add value for the citizens, healthcare personnel, healthcare sector and society as a whole in relation to:

VALUES

FASTER REHABILITATION

Prehabilitation may speed up the rehabillitation phase and enable the citizens to return back to their everyday lifes faster. In this way they return faster to their identity where they are not labeled as a patient. Hanne Tønnesen explains:

> *"I do not think that we should do it for the money, I think that we should do it for the health gain of the patients. But it seems interesting that it seems to pay off in any way you investigate it. If you have this prehabilitation, your organs function prior to surgery. And you get lesser complications and you save money and you have a shorter period as a patient where you are not able to manage your own life, which is really something which is very much in focus. You should be able to take care of your own life, to be the boss of your own life. So it is great in many ways" (Hanne Tønnesen, 2018).*

Not only is faster rehabilitation good for the citizens/patients, the shorter hospitalisation period etc. also has financial benefits for the healthcare sector. For society as a whole, bringing citizens back to their everyday life and work faster enables them to contribute to society and the collective economy again faster.

LONG-TERM HEALTHY LIFESTYLE

Prehabilitation can offer a good starting point and motivation for a long-term health focus and potential lifestyle change. The pre-procedure period presents an opportunity to teach the citizens preventive measures, i.e. to health-educate the citizens, in a period of higher citizen motivation. Learning to live a healthy life can both give citizens a better quality of life and a better state of health, which may in turn lead to less lifestyle diseases and health-related complications.

If citizens stay healthier for longer it may on the one hand increase their quality of life while on the other hand they may stay on the job market and contribute to society for longer, and at the same time have less need for healthcare services.

COMPLICATION REDUCTION

It is expected that prehabilitation will reduce the potential complications after surgeries and other major procedures, because the patients are in the

best possible condition before the procedure (Hanne Tønnesen, 2018).

Hanne Tønnesen underlines that prehabilitation has:

> *"a huge effect, if you quit smoking before surgery, quit risky drinking then you can half the complication after surgery. If you are overweight and if you are physically inactive you can reduce it with about 20%, so it is a lot. Usually when we talk about surgery and talk about complication if you reduce new programs introduce surgical methods or something like that then you might reduce it with a few percentiles. So reduce it with 20 – 50 % is amazing. So it has a huge potential for effect and we should absolutely use it" (Hanne Tønnesen, 2018).*

For the patients and their relatives, fewer complications may have a positive impact on the outcome, recovery and/or survival from the procedure itself as well as the risks of related complications later on in life for the citizen.

For the healthcare sector and society Hanne Tønnesen argues that prehabilitation presents a significant potential for cost reductions in connection with reduction of complications:

> *"what is great about prehabilitation, in relation to surgery, is that if you can get rid of or avoid just one patient with complications it is a lot of money we are talking about. In average the society of surgeons in the USA have calculated that a patient with a complication in average has an extra cost of 11,000 dollars. It is not far from our own calculations which say it is about 8,000 to 10,000 Euro you can save by reducing the complications with smokers etc. So this is a huge amount of money. So it is not a question about who should pay for prehabilitation, when it comes to surgery it is more a question about how should we spend the money that we save when we are doing this" (Hanne Tønnesen, 2018).*

Fewer complications may also affect the risks of related complications later on in life for the citizen. This may have the benefit of fewer people becoming chronically sick after complications of treatment, and therefore less need for complication-related future healthcare services.

EMPOWERMENT AND INVOLVEMENT

In prehabilitation the citizens are supported in taking an active role in managing their own health during treatment, recovery and lifestyle changes. Citizens who are able and willing to, are offered training, education, guidance, responsibility and the opportunity to improve their own health; a chance to 'participate in the fight'. In this way the citizens may feel more involved and empowered. Hanne Tønnesen underlines that:

> *"from our interview studies we know that the patient wants it. All of them want to have the offer of these kinds of prehabilitation programs. Small or more comprehensive prehabilitation programs" (Hanne Tønnesen, 2018).*

Society can utilise the motivation and resources of citizens in the collective healthcare efforts by enabling proactive and responsible citizens to take part in their own health. For the healthcare personnel the procedures become a collaboration between the healthcare personnel and the patient (and potentially their relatives). The healthcare personnel get a teammate and a chance to tap into the potential resources of the citizens who are able and willing to contribute.

COHESIVE SERVICES AND PROCEDURES

Prehabilitation processes that include the phases prior to, during and after a procedure may give the patient the feeling of one cohesive experience throughout the whole process. As a patient you will have knowledge about what will happen when and where, which may provide comfort and trust and you may feel that you are met as an individual and provided with a co-created patient pathway.

Hanne Tønnesen argues that:

> *"we actually need to add prehabilitation to any kind of patient pathway in the future because the benefits and the extra health gain you get when you integrate it in the interventional programs is so huge" (Hanne Tønnesen, 2018).*

Patients and healthcare personnel alike may have a more positive experience and be more satisfied with the procedure as well as the outcome. Prehabilitation may contribute to strenghtening the collaborative culture across sectors.

IMPROVED RESULTS

The expected outcome of prehabilitation is better recovery results in the end after the procedure and rehabilitation phase is over. Hanne Tønnesen argues that:

> *"we actually need to add prehabilitation to any kind of patient pathway in the future because the benefits and the extra health gain you get when you integrate it in the interventional programs is so huge. And all over the world the healthcare settings are really struggling to have sufficient money for treating, even the most simple diseases. And this pressure will not be reduced over time, in contrary it might increase; there is no sign in the future that we should have a reduction in the healthcare budget in any way. So it*

is really important to use all the tools that we have, all of the good interventions and integrate prehabilitation and health promotion in any kind of setting, in any kind of patient intervention" (Hanne Tønnesen, 2018).

Better recovery results means healthier citizens for longer, and healthier citizens are able to contribute more to society.

RISKS

Prehabilitation may, however, also present risks or negative implications for citizens, healthcare personnel, the healthcare sector and society as a whole.

CITIZENS

The optional nature of prehabilitation combined with the demands for citizen capabilities may have implications for the willingness, motivation and participation of the citizens. What is expected from the citizens? And what will their choice to participate or not mean for them?

HEALTHCARE PERSONNEL

Despite the expected patient benefits of prehabilitation, the healthcare personnel may oppose it if they do not see benefits for their department that match the efforts that prehabilitation programs will demand. Hanne Tønnesen provides an example:

"Money and business cases can convince managers and insurance companies etc. to do this implementation, especially if they see the money flow themselves. If you see it go to another box then you might not have the same interest" (Hanne Tønnesen, 2018).

It is also relevant to consider what role the healthcare personnel have in motivating the citizens, what that demands from them, and how we prepare them for this role. According to Hanne Tønnesen, a potential barrier for the immediate implementation of prehabilitation could be the current knowledge of the healthcare personnel. She explains:

"we know it is doable. But the main reason for not doing it, which also interview studies among staff in Denmark have shown, is … if you don't have the knowledge of course you cannot do it correctly" (Hanne Tønnesen, 2018).

She further concludes:

"so we have a lot of things to do for our staff in the hospitals and in the healthcare sector". Incorporating prehabilitation more in practice will demand further education of the healthcare personnel to

be able to support the patients in their prehabilitation efforts, e.g. if the focus is on reducing smoking or alcohol consumption, and the healthcare personnel themselves smoke or drink more alcohol than advised, it may be hard for them to give advice within this field (Hanne Tønnesen, 2018).

THE HEALTHCARE SECTOR

For the healthcare sector, prehabilitation may raise questions about how voluntary the participation in prehabilitation should be and how the offer or demand of prehabilitation activities will affect the equal offer of healthcare services. Including prehabilitation in healthcare services will also demand an investment by the healthcare sector. The potential barriers for reaping the full benefits of this investment should be considered and handled.

Supporting a patient's prehabilitation efforts may be time-consuming and challenging. For the healthcare sector it may be relevant to consider: What will it take to enable the citizens, to prepare the healthcare personnel and to realise the potential benefits of prehabilitation? And how will the prehabilitation results hold up against the necessary investments? Is quality improvement or resource optimisation the main goal?

Prehabilitation will require coordination and information sharing between on the one hand hospitals, where the procedures are carried out, and on the other hand primary care, where the prehabilitation will be anchored. How will the roles and responsibilities be divided between hospitals and primary care, and how will they be financed? How and when will information be shared? And what will it take to ensure a cross-sector decision-making and collaboration regarding prehabilitation?

SOCIETY AS A WHOLE

Motivating and enabling the citizens to participate in prehabilitation may prove challenging. Offering prehabilitation will necessitate an investment, and the benefits of prehabilitation have not been fully proven or documented yet. It will be important to decide whether the main goal and expected benefits of prehabilitation are higher quality services or resource optimisation, and consider how this decision will impact the investment. It is also highly relevant to consider who will pay for and who will achieve the potential benefits from prehabilitation.

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