

Prevention is better than cure, right?

A study into the opportunities and challenges of preventive healthcare

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By **Frisse Blikken** on behalf of the **Netherlands Study Centre for Technology Trends**

PREFACE

On the Internet, I came across the following quote about Chinese doctors: 'In ancient China, doctors were paid as long as their patients were healthy. If a patient became ill, payments would stop, only to be resumed after they recovered.' Whether, in light of the current economic and social developments, this quote still represents the current medical situation in China remains to be seen, but it is a very interesting approach, one that is at odds with the vast majority of healthcare in the Netherlands, where doctors only make their appearance when someone becomes ill. And it is only then that the money starts to flow. From patient to health insurer, from health insurer to health provider. And in between, there is the government with all kinds of allowances and subsidies. Our healthcare system is only put in motion in case of sickness and other medical inconveniences. On some level, we could perhaps be forgiven for thinking that the healthcare system does not mind that at all. Just wait until people become ill, then cure them or help them in different ways and send them the bill. Business assured!

But anyone who has experienced our healthcare system (and who among us hasn't?) knows that this is not how care providers think. In fact, there are few other sectors or professions where the intrinsic motivation is as high as it is in the medical sector. Care providers want us all to be healthy, making it all the more interesting to see that the healthcare sector invests so little in prevention. Why not make people healthier by making sure they do not become ill? Surely, that is much better? And a lot more efficient? Which makes it all the more relevant to examine why very little of the focus of our healthcare system is on prevention. Nobody wants to be ill, including ourselves and the care providers who need to treat us when we are. Of course making oneself redundant is not the ultimate goal of any person or organization, but in the healthcare sector, it is not such a crazy notion at all.

Stories about the future of the Dutch healthcare system almost exclusively focus on its spiralling costs and expected staff shortage. The problems of the future cannot be solved with money alone, especially if the money is not there. And because money has to be spent before it can be earned, the focus should be on prevention. At the moment, there is no other way to control the growing costs and make sure that we all have access to quality care that is also affordable. If we fail to act now, in the future, 'no cure, no pay' could well become 'no pay, no cure'.

This report contains an analysis of a number of cases involving preventive healthcare. The cases show what can go right and wrong with preventive healthcare. Because, in light of the urgency outlined above to tackle the expected problems, it is important to develop knowledge about preventive care, which is why this report, in addition to presenting the abovementioned analysis, also makes a number of recommendations about how we can start this transition.

My prediction is that the future of healthcare is mainly focused on prevention. But I have to admit that this prediction is also wishful thinking. And thankfully, the analyses and results of this report feed my forward-looking thoughts. And yours as well, I hope.

Dr Patrick van der Duin, Director of the Netherlands Study Centre for Technology Trends (www.stt.nl).

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0. SUMMARY

Why is it so hard to organize preventive healthcare? That is the question that this report tries to answer. The focus is on secondary prevention, the early detection of anomalies, illnesses or conditions. Because technology often plays a role in organizing effective prevention, we focus both on preventive interventions and preventive technologies.

In the research, we look at which conditions are important for effective preventive healthcare according to two meta-studies, after which we compare those conditions to the challenges and success factors from practical cases where prevention is applied.

Literature shows that there are three conditions for effective preventive healthcare: 1.) A low threshold for patients to use preventive intervention or technology, 2.) A large-scale and effective approach for all the parties involved in healthcare and 3.) Transparency about the costs and added value for the parties carrying out or investing in the prevention.

The study includes six cases in three areas of prevention: accidental falls, breast cancer and cervical cancer. In addition, experts were interviewed to obtain additional insight into the challenges involved. The research shows that the abovementioned three conditions to some extent play a role in each of the cases. However, a number of cases include challenges that are not defined that clearly in literature. They involve high investments for market implementation and improvements of preventive technology or intervention at the early stages. First of all, it has to do with the long-term investment needed to create willingness and awareness among care providers and the target group at which the preventive intervention or technology is aimed. Secondly, it is about the high costs involved in the market introduction. Finally, the cases demonstrate that new preventive interventions and technologies at an early stage often provide improvements that may only have a positive effect on the long-term effectiveness of the prevention. Insight and clarity about these improvements can help with the realization and maintenance of the preventive interventions or technologies.

In addition to these conditions, the general knowledge about the illness or condition also plays a central role in the organization or prevention. We can distinguish between two elements: 1. Cause: whether the illness or condition is clear, and 2. Signalling: how clear is the presence of the illness or condition. With regard to the three areas of prevention under study, these elements are most clearly developed in the case of cervical cancer, because its cause is clear and relatively easy to demonstrate. Breast cancer prevention is more difficult, because the cause is less clear and harder to demonstrate. In the case of accidental falls, prevention is the least developed, because there are many different causes that may vary between patients and because it is hard to identify people with an elevated risk of falling at an early stage.

We conclude the report with a number of recommendations, aimed at specific players in the healthcare sector and sorted by area of prevention. There are three recommendations for the prevention of accidental falls, aimed above all at the Ministry for Healthcare, Wellbeing and Sport and at companies that are involved in technology in the area of prevention. First of all, to reach an agreement at a national level about which measurable factors within the area of fall prevention improve healthcare, so that parties can work together more effectively. The second recommendation is to examine how technology can be used to measure the effectiveness of preventive interventions. The third recommendation is to investigate how technology can be used to identify people with an elevated risk of falling. Breast cancer prevention contains a recommendation for the government to examine whether there is room for (technical) innovations. And finally, there is a general recommendation for all the parties involved in preventive healthcare to reach out

to other parties, on the one hand to support and accelerate innovations in the area of prevention and on the other hand to help solve issues for which individual parties have no solution.

1. INTRODUCTION

1.1. Reason

Prevention is better than cure ... In our healthcare system, this saying is becoming more and more important. According to a foresight study by the RIVM (Volksgezondheid Toekomst Verkenning – Foresight Study Healthcare), healthcare-related costs are expected to double between 2015 and 2040 [1]. A third of those costs is related to the ageing population and much of the remaining costs involve investments in technology. The general expectation is that it is possible to make considerable cost savings by focusing on prevention: preventing illness and conditions. In addition to lower costs, prevention keeps people happy and healthy longer, which is why it is striking that our healthcare system spends so little time and effort on prevention and focuses primarily on treating people. An important reason for this is that it is harder to arrange funding for prevention. The party incurring the costs is often not the party reaping the benefits. For example, if a treatment provided by a physical therapist prevents a person from falling ill, it is the insurance company that benefits, rather than the physical therapist. In addition, prevention means that fewer treatments are needed, so it is even possible that the physical therapists end up with fewer patients. Another challenge is that prevention often requires citizens to adjust their behaviour, for instance by quitting smoking. Our healthcare system apparently does not force or encourage people to become involved in prevention, apart from making recommendations.

Effective prevention is often the result of intervention programmes that make people aware of the risks of an illness or condition and encourage them to adopt a healthy lifestyle, for example in the case of tackling obesity, one of the three priorities of the National Prevention Agreement [2]: People are made aware of the risks of obesity through national campaigns and, via interventions like the so-called Combined Lifestyle Interventions, the target group is offered the means to start living healthier lives.

Technology is a very important part of prevention. With the help of technology, it is possible to identify an illness or health risk at an early stage, for instance in the case of the national breast cancer screening programme, where mammographs are used to screen women. In addition, technology can help people live healthier lives. A good historical example is the construction of the sewage system, which improved general hygiene and reduced the risk of contagious diseases. So modern technology can play an important role when it comes to prevention. Devices like smartwatches with sensors and smart algorithms can be used to monitor our bodies constantly and alert the proper healthcare providers in time when something goes wrong. In addition, technology can improve people's behaviour, which is easier when the right information is available. A good example is that of sporting apps that are linked to smartwatches or bracelets and that provide information about people's physical condition and encourage them to exercise more.

Both preventive interventions and preventive technologies often appear difficult to organize. An important reason is the abovementioned lack of insight in to the resulting cost reductions . For companies, it has to be clear how they can make money from preventive services or preventive technology. The same commercial interests also play a role in the case of the healthcare providers. Preventive programmes can have good intentions, but if the healthcare providers are not rewarded, it is unclear where they fit into the preventive programmes.

That is why this study has two central research questions:

1. *Why is it so hard or impossible to organize preventive healthcare?*
2. *What are the conditions for organizing (more) preventive healthcare?*

When we say 'organize', we refer to a coherent long-term approach that has healthcare benefits, allowing people to live longer and reducing the occurrence of the illness or condition. Because effective preventive

healthcare is both about technology and interventions aimed at preventive illness or conditions, we include both areas in this report.

Terminology

In this report, the terms elderly, citizen, patient and risk group are used interchangeably, depending on the context: in the clinical environment, usually the word patient is used, in government prevention policy, the words risk group or citizen are used and in many social situations, we talk about the elderly. However, these terms all refer to the person (or persons) to whom the prevention applies. In addition, in this report we talk about preventive interventions, measures and technologies, in short preventive interventions and technologies.

In this report, we study challenges, success factors and conditions for effective prevention. The success factors and challenges deal with why the preventive intervention or technology is successful or difficult to organize, while conditions refer to the minimum criteria effective prevention has to meet in order to be realized.

1.2. Definition of prevention

There is no generally accepted definition of 'healthcare prevention' [4]. The definition we use in this report is: the early detection or prevention of an illness or condition in order to realize healthcare benefits. It is a broad definition.

Three forms of prevention can be distinguished:

- 1.) Primary prevention: preventing (the occurrence of) an illness or condition. This includes, for example, a healthy lifestyle and vaccination to prevent illness. It also includes the preventive removal of an illness or condition.
- 2.) Secondary prevention: the early detection of an illness or condition so that it can be treated at an early stage. Well-known examples in this category are the prevention of breast cancer and intestinal cancer, in which large sections of the population take part in a screening process to detect and treat symptoms as early as possible.
- 3.) Tertiary prevention: preventing illness or conditions from deteriorating. Examples are providing diabetics with a diet to help manage their condition and preventing wounds from becoming infected.

The focus in this report is on secondary prevention, because that is the type of prevention in cases and literature we examined. However, effective prevention is not limited to the early detection and treatment of an illness or condition, but also to preventing them, which is why we will also discuss primary prevention. For instance, with regard to the prevention of intestinal cancer, the aim is both to detect the illness at an early stage and to prevent it by removing the cause and encouraging people to live healthy lives. Tertiary prevention is discussed to a lesser extent, because we look more at prevention than at the cure or dissemination of the illness or condition. Because technology often plays a role in organizing effective prevention, we focus both on preventive interventions and on preventive technologies.

Prevention of an illness is a complex phenomenon. And as such not possible either. At best, we can extend the phase with a good quality of life. Through a healthy lifestyle and effective measures, like vaccination, we can postpone the illness. 'Procrastination' is a better qualification of the effect of a healthier lifestyle. For instance, through better hygiene and through vaccinations, infections are no longer a primary cause of death in the Netherlands. These days, it is cancer, which is also an area where we are making good progress.

Hans Hofstraat

Vice President at Philips Research

1.3. Approach

Overview studies into the conditions of prevention

There has been a lot of research into prevention in healthcare. We begin this study by looking at what two overview studies tell us about why preventive healthcare is hard to organize. We summarize the two overview studies and arrive at a number of conditions for effective prevention.

Research into the challenges of prevention in practice

Next, we look at prevention in practice, on the basis of concrete cases in which six different companies and organizations engage in prevention via a commercial product or service. These companies and organizations operate in three areas of prevention: accidental falls, breast cancer and cervical cancer. The cases vary considerably in terms of effectiveness and approach. In particular the area of accidental falls is different from the other two cases because it has to do with preventing a medical incident, rather than the early detection and prevention of an illness, like breast cancer and cervical cancer. Based on these concrete cases, we look at the reasons why prevention is slowed down or actually effective, which we then translate into success factors and challenges which are presented in a table for each of the three cases. In addition, we interview a number of experts for their views on the challenges for prevention. We compare the findings from the cases and the expert interviews with the conditions for effective prevention from the two overview studies. In addition, we compare the three areas of prevention, to understand why, in each case, prevention is or is not difficult to organize.

Recommendations

On the basis of the findings, we provide recommendations about what various parties can do to improve preventive healthcare in the three areas under study.

2. CONDITIONS FOR PREVENTIVE HEALTHCARE

2.1. Conditions according to two overview studies

To gain insight into the challenges for preventive healthcare, two overview studies were examined:

1. Prevention in healthcare – Thematic Report Public Health Exploration (RIVM, 2014) [2].
2. Prevention can be more effective! (NIVEL, 2012) [3].

Both reports collected the results of several studies to determine the challenges involved in prevention, so we gratefully used the two reports to define the challenges.

Prevention can be more effective!

The report 'Prevention can be more effective!' (NIVEL, 2012) looks at how prevention programmes can be designed and implemented more effectively. The focus is on programmes that are initiated by the family doctor, like cervical cancer screening and flu vaccination. The report emphasizes that large-scale and long-term participation in prevention programmes is a challenge. If more people take part and continue to take part, there are substantial health benefits. However, that is not a given, because people themselves decide whether or not they will take part in a prevention programme. A dilemma for people is that taking part in a prevention programme requires a considerable short-term effort, while the health benefits only occur in the longer term.

Prevention requires people to act and engage in long-term thinking, but people often focus on the short term. An interesting experiment was conducted involving people who would go on an outing for a week. A week in advance, they could choose whether they wanted to eat a Snickers bar or an apple. Most people chose the apple. During the outing, they were again given the choice, and this time, most of them chose the Snickers bar. This example shows that people have good intentions in the long term, but prefer to choose the easy and pleasant option in the short term.

Mattijs Lambooi

Senior researcher behavioural change and innovation at RIVM

The report indicates that it is important for all parties (care providers, insurers and the government) to aim for a high level of participation. Prevention programmes require a long-term investment from everyone involved. In the short term, the programme costs money, time and effort. The health benefits only occur in the long term. The implementation requires long-term decisions and vision, which is difficult in light of the short cyclical processes in politics.

Prevention in healthcare – Thematic Report Public Health Exploration

The Thematic Report Public Health Exploration (2014) by the RIVM looks at the opportunities and limitations of prevention in healthcare, with the researchers focusing predominantly on primary and secondary prevention. The report conducted a literature study to define the success factors of prevention. To order those success factors, the RE-AIM model was used (Glasgow et al., 1999), which defines success factors for prevention in five categories: reach, effectiveness, adoption, implementation and maintenance. These success factors have been summarized in table 1.

RE-AIM element	Translation and significance	Success factors
Reach	The number of people taking part in an intervention or programme.	<ul style="list-style-type: none"> • Free participation in detection and interventions; • The family doctor as spider in the web; • Other care providers for specific target groups; • Additional efforts for hard to reach high-risk groups; • Online participation.
Effectiveness	The effects of an intervention on the basis of a controlled effect study.	<ul style="list-style-type: none"> • Positive balance between desired and undesired effects; • Scientific approach to prevention; • Prevention based on treatment that has proven effective; • Effectiveness also demonstrated in hard to reach high-risk groups.
Adoption	The willingness of care providers or institutes to carry out an intervention.	<ul style="list-style-type: none"> • Detection and intervention can be fitted in in practice; • Existing infrastructure with multiple parties working together; • Structural compensation for providing healthcare prevention.
Implementation	The extent to which an intervention is carried out in practice as intended.	<ul style="list-style-type: none"> • Clear recommendations in terms of care standards and guidelines; • Monitoring of implementation and adherence to guidelines; • The ability to choose from a broad range of options.
Maintenance	The institutionalization of an intervention, laid down in procedures and standards.	<ul style="list-style-type: none"> • Standard monitoring quality in the entire chain; • Structural funding; • Securing behavioural effects in the long term; • Supportive environment.

Table 1. Success factors of prevention (Prevention in healthcare, RIVM 2014).

The success factors match the study by NIVEL in the areas of reach, effectiveness and maintenance. To be effective, enough people need to be reached by the programme or intervention. They first need to become aware of the effectiveness of the preventive measure based on the right information. Both reports see the family doctor as a central player when it comes to generating awareness and encouraging people to take part in the programme. For specific target groups, other care providers play a central role, like pregnant women who smoke (obstetricians), employees on sick leave with psychological complaints (company doctor) or vulnerable old people (district nurse).

The element of effectiveness is about demonstrating the effect of the preventive intervention or treatment. A central element is the fact that the intervention naturally has to have more positive than negative effects. Positive effects include the reduction of morbidity and mortality. Examples of negative effects are false positive and false negative test results, which can lead to misunderstandings, anxiety and tensions among people and generate health risks through overtreatment.

At an organizational level, the element of maintenance is about standardizing new interventions and, at an individual level, about preserving behavioural changes. Challenges in this area match the challenges in the NIVEL report about long-term participation and a vision to implement prevention in the long term. Many new forms of intervention are initially funded by projects, which at some point come to an end. To continue the prevention, structural funding is needed. Another success factor is monitoring the quality of the preventive approach. On the basis of measurements, screening methods are adjusted and improved continuously. In particular in the case of behavioural change, people's physical and social environment plays an important role in making them adopt healthier lifestyles.

When it comes to lifestyles, prevention is not much of a social priority. We are faced with stimuli from our environment all day. Those stimuli encourage you to act. At this point, many stimuli are unhealthy. In public place, like train stations, it is easier to buy unhealthy food.

Mattijs Lambooi

Senior researcher behavioural change at the RIVM

When it comes to adoption, the primary focus is on the environment of the intervention. Success factors are the willingness of care providers and institutes to apply prevention and the extended 'care infrastructure' for care providers in the entire chain. Examples of prevention with a successful infrastructure that are mentioned are vaccinations and cancer screenings, but the report is unclear what that infrastructure should look like for other prevention areas. In any case, an important aspect is the need for continuous monitoring and investments.

The area of implementation is about making sure the intervention is implemented as intended and for individual participants to continue to be willing to take part. Setting up and maintaining guidelines is the most important element here. A success factor for the willingness to continue to take part is a broad range of options for patients, so they can choose between different types of intervention.

Conditions for effective prevention

We divided the challenges and success factors from the two overview studies into three conditions that effective prevention has to meet.

Condition 1: Low threshold for the patient

This condition involves the patient. It captures the ease with which the patient can take part in the preventive measure, intervention or technology. As the NIVEL report explains, it is after all the patient who decides whether or not to take part in the prevention. As such, it is important to make it as attractive as possible. That begins by creating awareness among the risk group, so that they understand what the health risks are and how the preventive intervention or technology can help them.

An important element of our work is deciding how to inform the population in the proper manner about diseases and preventive measures. To that end, a lot of perception research is conducted. There are many factors that determine a person's perception. We try to lower people's barriers to encourage them to participate in prevention.

Mart Stein

Senior researcher infectious disease treatment LCI Cib at the RIVM

In addition, the patient has to be convinced of the added value and it has to be as easy as possible to take part. An important element in this is for family doctors and care providers to inform patients and encourage them to take part. If sufficient attention is paid to these elements, that will translate into high participation levels among the various risk groups.

There are many innovations and new technologies available in healthcare. A limitation is that people have little knowledge of the innovations involved. That is a reason why the Health Ministry has set up a website (zorgvannu.nl), a platform to showcase the technologies that are already available. By simply showing people what can be done, we are making progress already. Via our Facebook channel, we reach about 150,000 visitors a week, predominantly people who work in healthcare, like nurses. They are also people who can contribute ideas about the care that matches specific patients. In addition, zorgvannu.nl offers room for discussion to share knowledge and ideas and we share an average of two videos a week to distribute new knowledge.

Arjen Elsemulder

Senior Communication advisor and project leader at Zorgvannu.nl

Condition 2: Large-scale and effective collaboration

This condition has to do with the scale and level of collaboration between the various parties and the environment to apply prevention in an effective manner. The NIVEL report talks of active participation at all levels; individuals themselves, the parties involved in healthcare (care providers, insurers, government), while the RIVM report mentions the structural collaboration between different parties. The players involved vary per prevention area. In the case of cancer screening, for example, it is about the collaboration between the radiologist, the family doctor and the oncologist, to ensure that the patient is properly informed, referred and treated. In the case of the prevention of child obesity, this involves the youth healthcare provider, the child psychologist and the family doctor, to make sure that detection and treatment are properly coordinated. For an effective collaboration, it is important that all players share the same vision about the best way to prevent the illness or condition. In addition, the infrastructure has to be in place for these players to work together, with the results of the prevention being monitored and investments being made in improvements, as is currently being done with vaccinations and cancer screenings. It is important to provide the players with the time and resources for the collaboration and to reward them financially. In addition, the preventive activity has to be a part of the care provider's perceived duties, which means it has to be included in care standards and guidelines. In the areas of accidental fall prevention, for example, guidelines have been set up by the NKVG, a scientific organization, indicating how care providers can best reduce the risk of accidental falls among different target groups.

We see a lot of good ideas emerge for new technologies and innovations in healthcare. On the one hand, we see that about 85% of them never actually make it: ultimately, they are not included in everyday healthcare. On the other hand, we see an increase in the number of technological innovations being marketed (for instance receiving a CE-identification) on a daily basis, without understanding what exactly is the added value to healthcare and end-users. That is why a number of public and private stakeholders in the Netherlands have joined forces to organize a new infrastructure: Health Innovation Netherlands (HiNL). This is a public-private collaboration between government bodies, hospital organizations, professional associations, health insurers and businesses, aimed at evaluating, implementing and upscaling promising innovations. HiNL provides support to innovators (whether from the business community or the healthcare sector itself) by bringing together all the stakeholders and experts – who play a role in the process from idea en market realization to implementation in everyday healthcare. HiNL will become a kind of 'filter' by terminating innovations and perhaps even ideas for innovations that do not appear to be effective at as early a stage as possible, and on the other hand by accelerating those innovations and ideas that have great potential. HiNL was officially launched on January 29, 2020.

Carl Moons

Professor clinical epidemiology at the Julius Centre for health sciences and primary care

Condition 3: Transparency about costs and added value

This condition is all about transparency about the effectiveness. There has to be agreement among the players involved about the positive and negative effects of the preventive measure or technology and to what their relative weight is, because securing structural funding for a prevention is difficult when it is unclear what the costs and added value are.

Our society is the most advanced when it comes to battling infectious diseases. Hygiene played a major role in that. In addition, vaccines are an effective measure against the spread of infectious diseases. In the case of vaccinations, the calculation of the cost effectiveness is clear. It involves the costs of the vaccination programme against the costs you save because fewer people become ill. Determining the costs of screening programmes is more complicated. That involves including many factors that are both the direct result of the screening, for instance false positives that require additional and sometimes expensive follow-up research and false negatives that provide false reassurance, as a result of which the illness is sometimes discovered too late. The follow-up of the screening also has to be included. It can cost a lot of time and money to further diagnose a person who tests positive in the screening. Often, a biopsy is needed for confirmation, which is not without risk. In addition, screenings can cause people to worry unnecessarily, causing them to live longer with their disease. In the case of prostate cancer, of which most men do not die, this plays a role. All this turns screening into a complex theme that requires a careful weighing of the pros and cons. It is important to know that there are very effective screening programmes, like the one for cervical cancer. Thanks to screening, the number of women dying of cervical cancer has been reduced enormously. Other preventive measures also play a role like, since recently, vaccination. Actually, screening is not prevention at all, but early detection, which is very important for many forms of cancer.

Hans Hofstraat

Vice President Philips Research

2.2. Research into the challenges of prevention in the cases

2.2.1. The cases in question

In this study, we look at six cases in all, divided among three areas of prevention, as shown in the table presented below. Before discussing the cases, we first introduce the area of prevention, to give an idea about what is being done at the moment in terms of prevention.

Subject	Case	Company or organization
A. Prevention of accidental falls	1. Lifeline	Philips
	2. Laat je niet Vallen	City of Amsterdam
B. Prevention of breast cancer	3. National screening	RIVM
	4. Sensitive Sigma Paddle	Sigmascreening
	5. nu:view	AB-CT
C. Prevention of cervical cancer	6. Zelfafnameset	Self-Screen

Table 2. Cases included within the three areas of prevention

In each case, we examine why prevention does or does not occur and what causes this. At the end of each case, we summarize the success factors and challenges. In addition to the cases, we interviewed a number of experts to gain additional insight into challenges and success factors of an area of prevention or case. Relevant information from the expert interviews is included in the quotes throughout this report.

A. Prevention of accidental falls

For elderly people, falling often has major consequences. Often, it leads to a visit to the emergency room and hospitalization. It makes elderly people less independent and can lead to social isolation. Care professionals see accidental falls as a complex problem, because there are many different cases: from slippery stair cases to motor problems.

Increase in accidental falls

According to VeiligheidNL (SafetyNL) [5], between 2009 and 2018, the number of people over 65 who ended up in the emergency room after an accidental fall increased by 6%. That increase can be explained by ageing and a growing group of people of advanced age; on average, people live longer. That group of elderly people has an elevated risk of falling. The increase in the number of accidental falls leads to a lot of medical emergencies and follow-up treatments, which means that it also costs a lot of money. In 2015, accidental fall-related medical expenses were € 912 million. VeiligheidNL estimates that, if the current trend continues, those expenses will reach € 1.3 billion in 2030.

Approach to prevention

There is a lot of research into how best to prevent accidental falls. At a national level, parties like VeiligheidNL offer knowledge and interventions to prevent accidental falls. The Public Health Act (Wet Publieke Gezondheid) states that municipalities are responsible to the approach. There are considerable differences in what the municipalities do to prevent accidental falls. Apparently, they are not motivated to tackle the problem.

I hear little about the urgency and need for fall prevention in everyday practice, despite the fact that there has been a lot of research into it. Too often, the support for fall prevention is organized from the hospital, for example and not from the home situation where the patient runs the highest risk of falling. And although many parties indicate that something needs to be done, there is not enough attention in everyday practice. It is good to approach fall prevention less from a clinical perspective and more from the daily activities in a person's life, where the risk of falling is the highest. The causes vary per home situation and person. That is why it is best to monitor someone with a risk of falling for a number of weeks to see what the problems are and how they can be solved. Modern technologies like sensors could be used to see movement patterns and provide insight into risky situations. That is useful information for all elderly people with an elevated risk of falling, but also for elderly people with memory problems who are often unable to remember the situations themselves. In addition, that information can help inform and reassure caregivers and professionals. If the technology is affordable and sufficiently accessible, it can be broadly applied.

Jeroen Crasborn

Senior advisor care strategy Zilveren Kruis

Case 1. Lifeline by Philips

The Lifeline is a service for the elderly aimed at making it easier for them to live on their own, by providing better and faster care in case of accidents. Lifeline has various products. In the context of this study, we look at 'HomeSafe AutoAlert', a service that consists of a device with a fall sensor and call function, connected to care providers and friends or acquaintances of the person in question, who wears the device around the neck or wrist. When the person accidentally falls, the device detects it automatically and calls a care provider who assesses the seriousness of the situation in consultation with the elderly person and makes sure the proper help is provided. In emergency situations, an ambulance is called immediately. In less serious cases, the care provider contacts someone else, like a neighbour or relative. This service makes it easier for elderly people to keep living on their own, because they can be sure that help is available when it is needed. Philips provides the service in the United States and Canada. With about 600,000 users, the company is the market leader in those countries.

At the moment, a pilot programme is being conducted in Germany with the AutoAlert. In the rest of Europe, Lifeline is not yet available on the market. The difference between the Netherlands and the United States is that consumers are used to paying for the care they receive, which means that the customers are the elderly people themselves or their relatives. Philips is talking to healthcare insurers in Germany to see if it can be included in health insurance packages. In the Netherlands, devices for automatic fall detection are reimbursed with a declaration from the family doctor, although the monthly subscription fees are not. However, those monthly subscriptions make up the bulk of the costs. In the case of the AutoAlert, the monthly fee is US\$ 45.

An interesting advantage is that this service makes it possible to place elderly people in risk groups, which can serve as a basis for preventive measures. If a care provider knows the risk category of a patient, they can focus more clearly on reducing the risk. In addition, this service can provide the care provider with a reason to approach the patient in order to address the risk of falling.

Success factors	Challenges
<ul style="list-style-type: none"> • Easy to use. The only thing the patient has to do is wear the device around the wrist or neck. • The service is a good match for the elderly person’s social circle, which lowers the threshold for using it. • The automatic alarm provides better care than alternatives, like the emergency button, for instance in situations where the elderly person is unable to push the button. • Large-scale approach. The service is connected to a call centre with care providers, set up by Lifeline. Clearly demonstrable effectiveness by comparing user data with data of alternative options [6],[7]. 	<ul style="list-style-type: none"> • High investment costs due to setting up a call centre with trained staff who have to be available 24/7. • It takes a lot of time to create awareness among care providers and the target group about the added value of the technology. • More accidental falls could be avoided if the data of devices were to be integrated with hospitals. However, that would require an investment on the part of hospitals and a new approach from doctors. • The service does not treat the cause of the problem. Help can only be provided after a person has fallen. The technology could help with the early detection of people with an elevated risk, because the first accidental falls are usually not serious. However, it does mean that the target group is already using the technology.

Case 2. City of Amsterdam – Programme ‘Laat je niet vallen’ (Don’t let yourself fall)

In the last 10 years, the number of accidental falls in the municipality of Amsterdam has increased by more than one would expect on the basis of demographic developments. Accidental falls have an enormous impact on the individual in terms of their self-sufficiency and quality of life. In addition, there are considerable costs involved. There are interventions available that have proven to be effective, but without the help of the municipality, they are hard to organize, which is why the city has taken up fall prevention in the form of this programme [8].

The programme consists of interventions for the target group, people over 65, aimed at creating awareness of the risks of falling and activating the target group to reduce the risks. The approach is based on three pillars: 1.) Communicating and connecting, 2.) Signalling and screening and 3.) A substantiated and coherent offer. A large part of the intervention is aimed at communication and awareness. Examples are ‘MOT’ tests of walkers and informative meetings and training courses for care providers. In addition, professionals, like physical therapists, and volunteers are trained to signal and screen people with an elevated risk of falling. There is a coherent offering of interventions, aimed not only at improving strength and balance (in the form of training exercises), but also involving pharmacists to provide proper medication.

The focus of the programme is on collaboration between experts in various areas, because in the case of accidental falls, there are often multiple causes, like slippery soles, impaired vision or a lack of muscle strength. The causes vary per patient, and so does the approach, which is why care providers have to work together, with a trained care provider assessing the risk of falling and organizing the follow-up treatment. Within the programme, physical therapists are offered training courses to treat patients according to the proper guidelines. In addition to care providers, the programme also targets the social environment of the elderly person, so that, for instance, the informal network is also aware of the possibilities to do something about it and stimulate the target group.

Success factors	Challenges
<ul style="list-style-type: none"> • Coherent approach: the risk group, family doctor, physical and occupational therapists and neighbours are involved and even trained to reduce the risk of falling. • The programme consists of a package of interventions and training courses that have proven to be effective. The programme appears to be effective because of a clear influx and the fact that people take the interventions and training courses seriously. • The programme is aimed at ‘connecting’ professionals, allowing them to work together to reduce the number of accidental falls. 	<ul style="list-style-type: none"> • Fall prevention is not something people opt for immediately. ‘Not for me’ and ‘It’s part of getting older’ are common arguments. That makes identifying the risk group without having them lose interest in advance a challenge. • The collaboration between care providers requires considerable investments and is not a given. For family doctors, referring patients is difficult, because they do not know where fall prevention is being offered. On the other hand, if people are not referred, there is no fall prevention (chicken-egg). • For now, it is hard to demonstrate the health benefits within the municipality or put a number on them. • The city is funding the programme, but savings are made elsewhere, which means that the investing party is not the one that benefits.

B. Breast cancer prevention

Breast cancer is the most common form of cancer among women. In the Netherlands, 1 in 7 women is diagnosed with breast cancer [9]. Malignant breast cancer can be deadly because it often leads to metastasis in the body. However, if it is detected at an early stage, it can be cured, which is why a lot is being done about prevention. Preventive activities are not aimed at preventing breast cancer, because little is known about the causes. Instead, technology and prevention focus on detecting tumours as early as possible and removing them preventively.

Case 3. National Breast Cancer Screening Programme (Landelijke Bevolkingsonderzoek Borstkanker)

An important element of the prevention of breast cancer is the national screening programme, which was introduced in the Netherlands in 1990. All women between 50 and 75 are invited to take part in the breast cancer screening every other year. The age group was selected because it is an age group in which breast

cancer is more common. In addition, it is difficult to screen younger women with existing technology, because they have more glands and connective tissue in their breasts. And screening women above the age of 75 is also less effective, because the growth of breast cancer among that group is usually very slow, which often makes treatment unnecessary, while screening has more negative than positive effects. An important aspect of the screening programme is informing women about the symptoms of breast cancer and when they ought to visit the doctor to be examined.

Over the years, the screening programme has been criticized from different directions [10] [11]. Arguments that are mentioned are the high costs, low level of effectiveness and negative experiences of participants. False positives and false negatives can lead to overtreatment or health risks, which is why the national screening programme was discontinued in Canada in 2018 [12], where women can now apply for a breast cancer screening in consultation with their doctor if they want. The costs of the screening are reimbursed.

In response to these criticisms, the effectiveness of the screening programme was examined in 2014 by the Health Council (Gezondheidsraad), an independent scientific advisory body, which concluded that the screening programme continues to be worthwhile. The study states that some 775 lives are saved each year via the national screening programme and, in each case, 16.5 life years are gained. It has been calculated that the costs of the national screening programme in the Netherlands are 1,600 Euros per life year gained.

However, the experts remain divided about the effectiveness of cancer screening. One reason for that is that there are many contributing factors and not all of them are easy to quantify. For instance, it is not just about the number of prevented cases of breast cancer, but also about subjective factors, like the amount of discomfort and stress for the participants and the consequences for their quality of life. A clear figure at any rate is the roughly € 60 million that the screening programme costs each year.

Success factors	Challenges
<ul style="list-style-type: none"> • Large-scale approach in which radiologists, family doctors and other physicians work together in the same way at a national level, making sure the follow-up treatments match the screening. • A lot of effort is put into creating awareness for the risk group. All women between 50 and 75 receive a personal invitation and explanation, which is reflected in the high participation level of almost 80%. • Through constant monitoring of the screening and follow-up treatment, data like the number of tumours removed preventively and the number of wrong diagnoses are transparent. 	<ul style="list-style-type: none"> • High costs of about € 60 million a year. • The negative experiences in the case of false positives and false negatives, which can even create serious health problems. • Despite the clearly measurable results over many years, the experts are divided about whether the benefits outweigh the costs.

Case 4. Sigmascreening – Sensitive Sigma Paddle

The Sensitive Sigma Paddle of Sigmascreening offers an improvement for the mammograph that is currently used in breast cancer screening. The mammograph uses X-rays to create an image of the mammary gland. To be able to detect tumours, the breast is flattened by a pressure plate.

Sigmascreening has developed a new pressure plate that takes in account the size of the breast and adjusts its force accordingly, which means that all patients experience the same pressure. The pressure plate resembles that of the traditional mammograph, but the difference is that two pressure sensors and a surface meter have been added. On the basis of these sensors, special software determines how much pressure is needed to create a good image. The technology makes the procedure a lot less painful for many patients.

Especially for women with smaller breasts, the experience is better. You can imagine this by comparing it to a tennis ball and a basketball. When you apply the same pressure on both balls, the tennis ball will be squashed more. In addition to size, firmness is also a factor. A small ball made from material with little elasticity, like a field hockey ball, will be squeezed together to a lesser extent than a basketball, due to its rigidity. By letting the pressure depend on the size and firmness of the breast, it is possible to avoid (unnecessary) excess pressure, which makes the test less unpleasant for many women.

In addition to the improved experience for the patient, the customized pressure also produces superior imagery. When the pressure is too high, tumours and blood vessels can be pushed out and result in a negative outcome, when in some cases there is a tumour. This invention is a logical improvement of the existing situation, which is why the company has often been in the news over the years. However, there have been many challenges with the market introduction, as described below.

Success factors	Challenges
<ul style="list-style-type: none"> • The less painful experience can make patients more willing to take part in the screening. That advantage becomes more significant in the national screening, for example, where a large portion of the population is being screened. • Matches the way screenings are currently performed. Radiologists and lab staff have to make few adjustments when using the product for the first time. • Provides better images and fewer wrong diagnoses. 	<ul style="list-style-type: none"> • The costs of obtaining a CE certification and realizing the patents to protect the idea are high. • It takes several years to scientifically demonstrate the effectiveness of the product. • Since the introduction of the national screening programme, there is only one company in the Netherlands that provides mammographs for breast cancer screening. For a small company, it is difficult to enter into negotiations with that party, because of the poor negotiating position. • There is no lobby (party) that provides support for the market realization. • Clearly explaining the operation to doctors and radiologists appears to be a challenge. • There is no party representing the interests of women with regard to the painful experiences, so there is little stimulus to improve the situation.

Case 5. AB-CT – ‘nu:view’

The company AB-CT has developed a device for breast cancer diagnosis that is based on spiral-CT technology, the nu:view. Through an innovation in its operation, the scan, compared to competing

technologies, can be carried out much more quickly, accurately and with a lower radiation dosage. Instead of flattening the breast, the woman lies down on the device and the breast fits in an opening in the centre. The breast is not touched. The scans take a maximum of 12 seconds per breast and the radiation dosage is about the same as it is with mammography. The company obtained a CE-certification in 2018 for use in hospitals and at the moment, a lot of research is conducted into applications in various medical situations.

With CT (Computed Tomography), X-rays are used to measure the permeability of a body part from a number of angles. The scanner and receiver make a spiralling motion around the breast, creating thousands of images in 3.5 to 6 rotations. The software uses the images to create a 3D image of the breast. At the same time, two datasets are generated: one with a very high level of accuracy and resolution for the diagnosis and another with an even higher resolution for further analysis. Processing the data for the latter dataset takes about 15 minutes.

Normally speaking, a CT scanner has a so-called scintillator that translates the X-rays into light, which is then converted into an image by the computer. In the scintillator, the light particles (photons) spread out, making the image less accurate. AB-CT has found a way to translate the X-rays into electrical signals right away, which the light particles no longer spread out and the images are much more accurate. An additional benefit is that it requires a smaller X-ray beam.

An interesting advantage is that the technology can be used to compare images from different time periods. During a mammograph, the breast can take on different forms when it is being flattened, which means that the images will look different each time, making it possible to see changes in the tissue, which can be helpful when a small object is detected and there is little clarity about the potential damage. In that case, the patient could come back a few months later for another scan, potentially making invasive examinations like a biopsy less common.

Success factors	Challenges
<ul style="list-style-type: none"> • There is no painful experience, which means that patients will be more willing to be screened. • Low radiation dosage. • Hi-res images with complete 3D-visuals, making it easier to detect tumours and reduces the number of errors (like false positives and false negatives), which leads to a more effective treatment and improved patient experience. 	<ul style="list-style-type: none"> • Elaborate legislation making it very difficult to have private clinics use the device for patients who also take part in the national screening. • The national screening programme has a monopoly on diagnostic equipment. A hospital could decide to use nu:view, but the investment would be a barrier, because the device focuses on one thing only. • Screening requires a separate CE certification, which requires several years of research with a large number of patients.

C. Prevention of cervical cancer

Cervical cancer is a tumour in the cervix. This form of cancer takes a long time to develop, often ten to fifteen years. In the Netherlands, each year about 700 women develop cervical cancer (8 in 100,000) [13]. Women with cervical cancer have about a one in 70 chance of being cured. On average, 250 women a year die of this disease.

Change in approach

The approach to the prevention of cervical cancer has changed considerably in recent years. A number of years ago, it was discovered that almost all cases of cervical cancer are caused by the HPV virus (Human papilloma virus). Normally, viruses are neutralized by the body, but this virus is able to adapt, and in some cases adapt the DNA of cells, which then begin to multiply. The virus is transferred through (unsafe) sex and most women contract the virus when they become sexually active.

Combination of vaccination and screening

Because we have a good understanding of the cause of the virus, a lot is done about prevention. Since 2008, there is a national vaccination programme and since 2010, girls of 12 years and older can be vaccinated. However, it is estimated that the vaccination is effective in 80% of all cases, which is why it is still necessary to continue screening. In the past, the only way to do so was by conducting a diagnostic test to examine deviating cells from the cervical cancer. Since 2017, the screening process is based on the detection of the HPV virus. Every five years, every woman between 30 and 60 is invited to be tested, which consists of a pap smear by the family doctor.

Case 6. Self-Screening kit – Zelfafnameset

The Self-screening kit is a kit with which women can get a pap smear themselves without the family doctor. It was introduced in 2018 to lower the threshold for taking part in the screening process. To determine its reliability, a study was conducted among 14,000 Dutch women. They were divided into two groups, those who had a pap smear at the family doctor's and those who did it themselves. Next, the groups changed places, with the first group doing the pap smear themselves and the second group getting it from the family doctor. The results were compared and no significant difference between the two groups was found. The study is proof of the effectiveness of the test and explains why it was introduced on a national scale.

The advantage of the Self-screening is that it saves a trip to the family doctor. Currently, half a million women visit the family doctor for a pap smear each year [14]. If a part of those women does the screening at home, that saves a lot of work. A disadvantage is, however, that only during a visit to the family doctor it is possible to examine the cell material immediately for the presence of the HPV virus and the deformation of cervical cells. In the case of Self-screening, it is only possible to check for the presence of the HPV virus. If that is the case, the woman still has to visit the family doctor to be examined. Because it takes a number of days to wait for the result, that can cause stress and uncertainty [15]. In addition, there is a chance that not all women visit the doctor for the follow-up examination. The likelihood of contracting the HPV virus is low, but not insignificant: 7%. Ultimately, only a minority of those 7% requires treatment, so many women would worry unnecessarily.

At the moment, a significant group of women does not take part in the national screening programme: 40%. That may have to do with a reluctance among women to have their family doctor administer the pap smear. What also may be factor is that women prefer not to think about the risk. It is expected that the Self-

screening kit makes it easier to take part, resulting in a higher participation level [15]. A reason for women to visit the family doctor is to have the feeling that nothing will go wrong. That may explain the low number of users: in 2018, only 7 percent of women applied for a Self-screening kit. What also plays a role is that the invitation to take part in the screening programme emphasizes the visit to the family doctor and to a lesser extent the Self-screening kit. At the moment, the RIVM is looking at ways to increase participation levels.

Success factors	Challenges
<ul style="list-style-type: none"> • The effectiveness of the Self-screening kit has been clearly demonstrated. • Lowers the threshold for many women to get tested, because they can do it on their own and do not have to visit their family doctor. • De Self-screening kit is an addition, so few changes are needed to the existing screening • Women who use the Self-screening kit only have to visit the family doctor in case of a positive result, which means less work for the family doctor. 	<ul style="list-style-type: none"> • Once the presence of the HPV virus has been established, the patient still has to visit the family doctor for a pap smear, which can cause stress and uncertainty. This step is not necessary if the pap smear is performed by the family doctor. A study has been set up to improve the analysis, so that the extra visit to the family doctor is no longer necessary [16]. • It takes time for the target group to become familiar with the Self-screening kit and to start using it. It is expected that the number of users will increase. • Having the family doctor perform the screening inspires confidence that it will go well. That can be a reason not to do it at home.

2.3. Comparing the cases with the two overview studies

The two overview studies listed three conditions for effective prevention: 1.) A low threshold for the patient, 2.) A focused collaboration between all the players involved and 3.) Transparency about the costs and added value. These conditions are present in the cases to varying degrees.

Low threshold for the patient

What the technologies and programmes have in common is that attention is paid to user-friendliness, making it easier for the patient to take part. In the case of breast cancer, both the technology of Sigmascreeing and AB-CT offer an improvement of the experience for women by removing the painful aspects of the medical treatment, making it more attractive to take part in the breast cancer screening. The pain is mentioned as one of the reasons making the national breast cancer screening less attractive, in addition to negative experiences involved false-positives, false-negatives and overtreatment.

Because of the false-positives, you make a group of people worry who essentially are healthy. And with the false-negatives, you reassure people who need to be treated. The fear or negativity plays an important role, which is a reason that the screening has to be accurate.

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The improvement of the screening technology leads to a higher degree of accuracy in the images, and ultimately to fewer false positives and false negatives. The main aim of the Self-screening kit used in the prevention of cervical cancer is to lower the threshold for specific targets groups and boost the relatively low participation levels.

The fall prevention service of Lifeline lowers the threshold for paying more attention to accidental falls through ease of use and a connection to the social environment of the elderly person. Factors that may prevent those elderly people to use Lifeline is that they need to have the device on their neck or wrist at all times and the high subscription fees. In the Amsterdam case, the threshold is lowered by involving the environment in the intervention in question. However, approaching elderly people with an elevated risk is a challenge, because they prefer not to think about it. In addition, it is hard to determine whether every person in the risk group is really made aware of the use of the intervention and is persuaded to take part.

Large-scale and effective collaboration

The national screening programmes for breast cancer and cervical cancer are examples in which parties from different disciplines work together effectively on a large scale to reduce the number of incidents. This large-scale approach is also present, although to a lesser extent, in the case of fall prevention. In Amsterdam, to reduce the number of incidents, not only elderly people themselves are approached, but also their entire social environment. Family doctors are informed, neighbours are encouraged to activate the target group and care providers are trained to make a diagnosis and offer preventive treatments, all of which makes it easier for the elderly to actively take part. However, at the moment, the approach is not financially self-sufficient, so it will be a challenge to keep it in place in the longer term. An effective collaboration also exists in the case of Lifeline. The service is connected to the medical emergency and friends or relatives of the elderly person, and is directed by trained care providers via telephone. There is less of a large-scale and effective approach with regard to the product of Sigmascreeing, because it already matches the approach of the national screening programme, which means that little has to change to use it. Using the nu:view would require a more considerable change, because an entirely new device (instead of a mammograph) would lead to a new diagnostic and follow-up approach.

I was involved in a study about the implementation of electronic patient files (EPF's) at a hospital. One of the findings was that it is important that the entire organization adopts it in their everyday practice. If that does not happen, the result is often less than optimal. In this case, the doctors and nurses were obliged to use it, but in the case of a preventive measure, it is the patient who will make the decision.

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Transparency about the costs and added value

Transparency about the costs and added value are to a varying degree present in every case. The costs of Lifeline are clear, because the elderly or their relatives pay for it. In addition, Lifeline conducts studies to support the added value for consumers and care providers. However, for the City of Amsterdam, measuring the health benefits is difficult. It is only possible to give an indication based on the use of demonstrated

interventions and participation levels. In addition, the problem is that the municipality is funding the programme, while it is ultimately other parties that benefit from the costs savings.

With regard to the national screening for breast cancer, many of the factors regarding the costs and added value at a national level are known, including the overall costs and the total number of lives saved. However, there is discussion about the effectiveness, because experts are divided about the relatively importance of negative experiences, like the false positives and false negatives.

An important added value of both Sigmascreening and AB-CT is that they make the scans less painful for a lot of women, which lowers the threshold for participation. However, it is not clear how many more people would take part in the screening as a result. The same problem occurs with the Self-screening kit for cervical cancer. It is expected that the kit will have a positive effect on the participation level, but it could be years before that is actual proven. That also applies to the effect of negative effects, like the extra visits to the family doctor in the case of a positive result.

High investments for market implementation

There are a number of success factors and challenges that emerge from the cases that are not easy to explain based on literature. They predominantly involve the high investments of market implementation and improvements of the technology or intervention in the early stages.

The Prevention in healthcare (Preventie in de zorg) report (RIVM, 2014) mentions implementation and adoption, whereby implementation refers to the application of an intervention as prescribed in guidelines or care standards, designed by a regulatory party. Adoption is about the willingness of care providers or institutes to carry out an intervention. However, the report appears to treat that willingness as a given, but a recurring challenge in the cases is that the willingness to engage in the large-scale use of technologies and interventions has to be created. That requires a long-term investment to make relevant care providers and the target group aware and convince them of the added value. In the situation involving nu:view, before the technology can be deployed on a larger scale, doctors and radiologists have to become familiar with the technology and to be convinced to purchase it as an improvement of existing equipment. Another example is the start-up of Lifeline. For the service to be effective, call centres had to be set up and care providers needed to be trained. In addition, both Lifeline and nu:view invest in research to show the added value. The low participation level of the Self-screening kit for cervical cancer is another example that shows that it takes more time before people are familiar with this option and start using it. That investment is also visible with the introduction of interventions, for instance the case of the City of Amsterdam, where a high investment is made in the first year to create awareness at multiple levels and to teach care providers to apply fall prevention.

High investment costs also play a role in the realization of the preventive intervention or technology. In the case of Sigmascreening, that refers to the high costs for obtaining a CE certification and protection of the idea, which requires higher investments and more time. The same goes for AB-CT. Obtaining a CE certification for the screening requires research with a large number of users that is likely to take several years. For Lifeline, it is about conducting research and the costs involved in setting up call centres and training staff. This shows that the introduction of these ideas takes time.

What I often see is that the technology is there and that care providers want to use it, but that things go wrong with the implementation. Products have to be incorporated in the business process so that care providers are motivated to start using them. Purchasing something is usually not enough, the technology has to be actively applied and used. Marketing a new product or service often is a lengthy process, because it takes a lot of time to create supply and demand. People first need to be become aware of the technology and the added value and then it takes a change in behaviour to get them to use it. That is usually the bottleneck for innovations.

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In addition, a number of cases shows that, if the technology or intervention has been introduced recently, its effectiveness can still improve. At the moment, in the case of the Self-screening kit, it is investigated how improvements can prevent women from having to pay their family doctor an extra visit, which can have a significant impact on their willingness to use the Self-screening kit. Another example is the case of nu:view, where the technology makes it possible to compare scans over the course of several months, which may lead to fewer biopsies and preventive operations.

In addition to generating willingness, market conditions can also be a challenge. AB-CT and Sigmascreening face the same challenge in the Netherlands. Because one party is the provider of all mammographs for the national screening programme, it is hard to market the technology.

Extra condition: sufficient investments for implementation and adoption

The challenges discussed above point to a fourth condition, which according to the cases is essential for a successful market introduction of a preventive intervention or technology, which is the need to create awareness among relevant players to start using the intervention or technology and the additional costs involved in implementing the intervention or technology. Improving the technology or intervention over time can play an important role in facilitating the implementation process.

3. CONCLUSIONS

3.1. Why is preventive healthcare hard to organize?

This study shows that there are four conditions that play a crucial role in the introduction of prevention. If little or no attention is paid to one or more of these conditions, that will make the introduction and execution of a preventive intervention or technology more difficult.

1. Low threshold for the patient

This condition refers to the ease with which patients can take part in the preventive intervention or technology. If enough attention has been paid to all the other conditions, but the threshold remains high for patients to take part or use the technology, participations levels will still be low. So it is essential to focus on the patient. An example of a threshold is that of the high subscription costs of Lifeline, which likely would prevent a large group of elderly people in the Netherlands to use the service. Another example is the Self-screening kit used in the national screening programme for cervical cancer, the aim of which is to make it easier to take part. However, to obtain the kit, at the moment, women first need to refuse to visit the family doctor, which may increase the threshold for using it.

2. Large-scale and effective collaboration

This condition has to do with the scale and degree of collaboration by the various parties and the environment to apply the prevention. If a large-scale collaboration is lacking, the result is fragmentation, which has a negative impact on the effectiveness, because different parties approach the problem in different ways instead of tackling the problem together. For instance, in the Amsterdam case, it is difficult for family doctors to refer patients because they do not know whether and where fall prevention is being offered. The same applies to the administrative level, where municipalities try to reduce the number of accidental falls in different ways and with different budgets. The national screening programmes for breast cancer and cervical cancer are examples of effective large-scale collaboration.

3. Transparency about costs and added value

This condition refers to the fact that it has to be clear how effective the intervention or technology is. The players involved have to agree about what the positive and negative effects are of the preventive measure or technology and what their relative weight is. When that agreement is lacking, there will be discussions about the effectiveness of the preventive measure. An example is that of the negative side-effects of breast cancer screening. If it is insufficiently clear what the added values are, that has a negative impact on the introduction of a preventive measure or technology. This is a barrier in the case of fall prevention, which may explain why there are so few broadly applied new technologies in this area: it is unclear what the health benefits will be. Through its large-scale approach, Lifeline has defined and demonstrated the added value of its service itself by comparing the technology with similar technical solutions.

4. Sufficient investments for implementation and adoption

This has to do with the time and costs for the launch and upscaling of a new preventive service or intervention. It is important that enough resources are made available to set up the intervention. In the case of Lifeline, that involves setting up call centres, and with AB-CT and Sigmascreening, obtaining the necessary CE certification, which can take several years. In addition, investments are needed to create a willingness among relevant stakeholders to start using the preventive technology or intervention. In the case of Lifeline, AB-CT and Sigmascreening, this includes research demonstrating the added value of the preventive technology in various situations, to convince the risk group, care providers and customers of the added value. In the Amsterdam case, it involves training care providers to apply the fall prevention. In addition, innovation in the preventive technology or intervention can create new benefits that affect the

implementation, for instance in the case of nu:view, where the ability to compare scans can help organize follow-up treatments differently.

If little attention is paid to this condition, that increases the likelihood that the prevention fails to be adopted in the first few years, which happens to 85% of all new technologies and innovations in the healthcare sector. A realistic idea of the market, the target groups and the steps that are needed for implementation and adoption make it possible to ensure that that does not happen.

3.2. Cause and signalling of prevention

The cases we examined here focus on three areas of prevention: accidental falls, breast cancer and cervical cancer. Prevention has not been developed to the same degree in all three areas. That has to do with two elements:

1. Cause: whether the cause of the illness or condition is clear.
2. Signalling: how clear is the presence of the illness or condition.

These elements are to a different degree present in each area of prevention and can be plotted along two axes, which provides insight into the current position of the area of prevention.

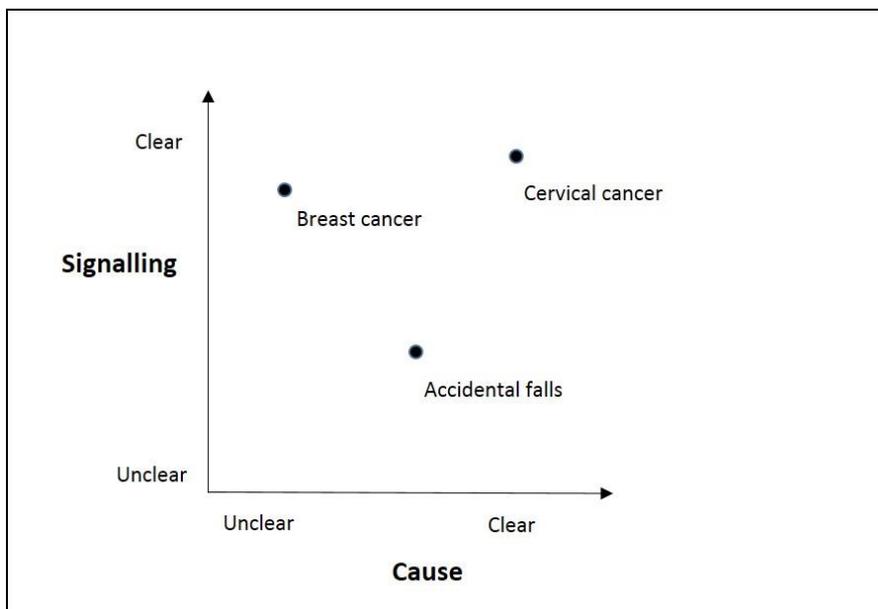


Figure 1. Cause and signalling for the different areas of prevention

If we compare accidental falls, breast cancer and cervical cancer, we see that the prevention of cervical cancer is more advanced, because the cause is clear and can be ascribed to a single factor, the HPV virus. The presence of the virus is easy to demonstrate with simple tests, which means that the signalling is relatively simple. The national coordination ensures a large-scale and effective prevention. In principle, cervical cancer could be completely prevented in the future. An interesting question is how cost-effective the screening programme will be if all women are vaccinated, which prevents the development of cervical cancer in 80% of all cases, making the vaccination of the remaining 20% relatively speaking more expensive.

In the case of the prevention of breast cancer, there are more challenges, because its cause is unknown, which is why technology does not focus on prevention, but on early detection and removal. Breast cancer is more difficult to detect than cervical cancer. Often, the scan provides insufficient information, making follow-up treatments like an echo or biopsy necessary.

The prevention of accidental falls is the least developed of the three. Although the causes are often clear, they vary per patient and require a specific case-based approach to reduce the risk of falling, making prevention more complicated and time-consuming compared to the other two areas of prevention. In addition, identifying the risk group is a challenge. At the moment, the best way to find this group is to ask them in a questionnaire or in a personal interview. However, in the Amsterdam case, interviewing people may actually reduce their willingness to participate in the programme. Lifeline uses a different approach by using smart software and a large amount of data to divide the users into risk groups. However, in order to be able to do that, the risk groups have to already be using the device.

4. RECOMMENDATIONS

The second question of this study was: *What are the conditions for organizing (more) preventive healthcare?*

Based on the cases we examined and the analyses, we can present recommendations for each of the three areas of prevention. The recommendations are aimed at different parties, but most of all at businesses and the government. Most recommendations involve the area of fall prevention, because that is a complex challenge with an incoherent approach, which means that it is also the most suitable area for improvements.

4.1. Recommendations for preventing accidental falls

1. Make the effect of interventions and technologies on health benefits measurable

Aimed at: the Ministry for Health, Wellbeing and Sport (WVS), municipalities, businesses, care providers and healthcare insurers.

The lack of a method to measure the effectiveness of fall prevention interventions and technologies is an important reason why it is difficult to tackle fall prevention in collaboration with different care providers. To be able to address the immediate effectiveness requires factors that can be measured over time, like the number of steps or the amount of physical exercise. In these cases, we talked to different people who are involved in different ways in fall prevention. It is smart to involve people from all the stakeholders to think about which factors are important when it comes to making fall prevention measurable. Relevant parties include at any rate physical therapists, occupational therapists, municipal project leaders, elderly people themselves and healthcare insurers. An important point is that the factors do not have to be a 100% accurate reflection of reality. The aim is to provide direction to the different parties and encourage them to work together to reduce the number of accidental falls.

2. Investigate how (sensor) technology can be used to measure the effectiveness of fall prevention

Aimed at: businesses

This recommendation follows from the first recommendation. Technology, like sensors, can possibly be used to measure the effectiveness, but there first has to be agreement about what exactly has to be measured. Sensor technology can measure many healthcare-related values, for instance indoor movement patterns, while e-health technologies can monitor factors like heart rate and the amount of physical exercise. If the factors that need to be measured are clear and it has been examined how technology can measure them effectively, businesses can develop the technology, which can then be applied in a coordinated manner in fall prevention programmes.

3. Examine how technology can be used to screen for people with an elevated risk of falling

Aimed at: WVS, businesses

At the moment, there is a screening method that is used on a large scale, namely by having elderly people fill in a questionnaire or interviewing them directly. A drawback of these questions is that they are not always asked at the right time. It has to be examined whether technology can be used to identify risk groups even before accidental falls occur, or at least as early as possible. The Lifeline case shows that there are

links between certain values that are measured and the risk of falling. If it is possible to find a way to measure those links, it then has to be examined how that technology can be used on a large scale.

4.2. Recommendations for the prevention of breast cancer

In practice, at the moment people are considered to be at risk after an accidental fall occurred. Perhaps the triage needs to change to devise a better screening method. With a structured approach, that screening method could be used on a large scale. For that to happen, different parties have to reach an agreement. Using a clear screening method and a low-threshold monitoring technology would make it possible to reduce the number of accidental falls effectively.

Jeroen Crasborn,

Senior advisor care strategy Zilveren Kruis

Create room for (technological) innovations within the national screening programme

Aimed at: RIVM

Both the Sigmascreening and AB-CT cases showed that market introduction in the Netherlands is difficult because one company provides all the mammographs for the screening programme. It is hard for a small company to work together with that company, because of its negative negotiating position, which slows down market innovation. The fact that all the mammographs that have been purchased in the last 25 years are from the same brand, when there are several alternative providers, shows the lack of change in this area. It has to be examined why that is and whether the screening can be improved with new (technological) innovations or the use of different equipment.

4.3. General recommendation

Look for ways to work together with other parties in healthcare to support new interventions and technologies for prevention in terms of their market introduction

Aimed at: VWS, businesses care providers, healthcare insurers, hospitals, professional associations

This report shows that there are many reasons why preventive healthcare is hard to organize. Successful preventive interventions and technologies have to meet the following conditions: 1.) low threshold for participation, 2.) large-scale and effective collaboration and 3.) transparency about costs and added value. In addition, the cases show that in particular the implementation and adoption of a new intervention or technology poses certain challenges.

The area of clinical technology within healthcare faces a similar challenge. According to Health Innovation Netherlands, 85% of all technological innovations ends up not being used in the provision of everyday care. By organizing a collaboration with relevant stakeholders – like government bodies, hospital organizations,

healthcare insurers, professional associations and businesses – promising innovations can be scaled up and implemented more quickly and effectively. By bringing together the right experts, research for a CE certification has to be made more efficient.

In a similar way, businesses and those who pioneer new preventive technologies and interventions should be supported. By working together with those organizations, it is possible to have a clear insight more quickly about what to do to bring new ideas to fruition. In the case of a service like Lifeline, the technology, call centres and trained care providers have to be provided by different parties. That way, the investment risks are shared and more parties benefit from a successful realization of the preventive technology or intervention.

In addition, this construction is interesting in case there are problems that one business or organization is unable to solve on its own. In the Amsterdam case, for example, a fundamental problem was that the party making the investments was not also the one reaping the benefits. With an independent party to which organizations with different backgrounds are connected, it would be possible to see how investments and savings can be made more transparent, for instance by coordinating which factors are relevant in measuring fall prevention and examining how they translate into cost savings. Such a party can examine complex issues regarding prevention and suggest and test solutions.

It is important to examine whether an independent organization can be set up, on the one hand to support and accelerate the innovations in the area of prevention, and on the other hand to help with issues that the individual parties are unable to solve.

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List of interviewees

- Mark Johnson - Vice President and senior researcher at Philips Research
- Sandra Vosbergen – Senior usability designer at Philips Design
- Hans Hofstraat – Vice President at Philips Research
- Johan Oste – Senior policy advisor healthcare
- Jeroen Crasborn - Senior advisor healthcare strategy Zilveren Kruis
- Arjen Elsemulder – Senior advisor communication
- Ard den Heeten – Former professor of radiology at AMC university hospital in Amsterdam and scientific advisor at Sigmascreening
- Carl Moons - Professor clinical epidemiology at the Julius Centre for healthcare sciences and primary care
- Mattijs Lambooy - Senior researcher behavioural change and innovation at the RIVM
- Mart Stein - Senior researcher infectious disease treatment LCI Cib at the RIVM
- Paul Valckx – Project manager at AB-CT
- Benjamin Kalender – CEO at AB-CT