KPMG

The MedTech market in the Netherlands

Produced for the Dutch Ministry of Health, Welfare and Sports

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Executive summary

The purpose of this study is to provide an objective snapshot of the current medical technology market in the Netherlands

Our analyses confirm that the outlook for the global market for medical technology is very optimistic as the sheer size of the global market (valued at €385bn in 2016) presents a huge opportunity and technological advancements continue to allow for new and improved applications across all therapeutic fields. Consequently, we observe an increasing variety of technological applications that are being developed and used for the treatment and support of patients in hospitals, nursing homes and in the home environment.

The rapid development of these new medical technologies is causing the supplier and provider landscape to evolve constantly. Both from the supply and demand side, new business models and ways of working are being introduced that have an effect on the way in which MedTech is used for the treatment of patients. Furthermore, new European regulations governing market access of new medical devices (MDR, 2020) and in vitro diagnostics (IVDR, 2022) are expected to impact the MedTech market in the next decade.

The Dutch medical technology sector reflects the international landscape as Dutch suppliers cover a broad range of technologies and service practically all segments of the healthcare sector. Given evolving patient needs and technological possibilities, the dynamics in the MedTech market are therefore constantly changing. Innovation in the sector is fast-paced and it is difficult to predict which innovations in MedTech will actually add long-term value in terms of quality of care.

These changes and developments in the global and local Dutch medical technology market entail a multitude of challenges and opportunities for various stakeholders. In order to put these developments into perspective, the Dutch ministry of Health, Welfare and Sports (VWS) asked KPMG to conduct a study which will serve as a baseline for future measurement.

In light of this, our study aims to provide an objective snapshot of the current status of the medical technology market in the Netherlands. As VWS itself indicated, this research has two main purposes:

1. Current status update (status quo) of the sector including an independent estimate of the market size measured by value, as well as an overview of the market structure and most important actors;

2. In addition, this report (in combination with the RIVM horizon scan which is planned for Spring 2018) aims to identify emerging trends and technologies that are shaping the Dutch medical technology market today and will do so in the future. This knowledge will help VWS to formulate its policy more effectively going forward, especially in the context of the new MDR/IVDR regulations.

Executive summary

Conclusion

The overall results of our research show that the medical technology market in the Netherlands was valued at an estimated €4.7bn in 2016 (broken down on the following pages). This estimate is split between intramural (within the walls of an institution/hospital) and extramural care (outside of the walls of an institution/hospital), which are valued at about €2.4bn and €2.3bn respectively. Moreover, a gradual shift from intra- to extramural MedTech seems to be taking place.

Most of the MedTech purchased in the Netherlands is covered by basic health insurance or municipality reimbursements. In total, some 85% of the MedTech market is covered by some form of reimbursement.

An estimated 500-700 medical technology suppliers are active in the Dutch MedTech market, 95%-97% of which are small and medium enterprises (SMEs). Large suppliers are often preferred by larger hospitals because of their ability to deliver consistent quality in terms of volume and performance. As a result of the small number of larger Dutch MedTech players, a robust view on the profitability of the industry is not possible. Our limited dataset suggests that profitability (EBIT) has slowly decreased to an estimated 10%.

Given the vast scope and size of the healthcare industry and technological developments, many trends are observed. We consider the following medical technology trends most relevant for the Dutch market:

- Hospitals are making a gradual shift from invasive to less invasive technologies, which potentially can reduce the duration of treatments and the complexity of the resulting wounds;
- Large medical devices are increasingly becoming smaller;
- There is a continual shift from therapy and treatment to prevention, especially driven by e-health solutions and smart apps;
- Healthcare is becoming increasingly personalised and medical technology is becoming more focused on the specific patient;
- Patient care is making a gradual shift from intramural care to care in the home environment, aided by advancements in medical technology. Patient-data-sharing technologies, such as wearables and the Internet of Things are further evolving to enable seamless delivery of care remotely, as well as in clinical/hospital settings;
- Large MedTech suppliers are making a gradual shift towards customer-centric business and service models;
- The traditional supply chain for MedTech could be disrupted owing to developments such as vendor-managed inventory systems, the Internet of Things and direct sales by medical device manufacturers in the extramural market, although we acknowledge that the structure of the institutional landscape is partly responsible for this;
- There is increasing use of smart apps that are integrated with medical devices to provide real-time access to patient data and help to improve clinical decision-making.

Executive summary

Size of the medical technology market in 2016	
Therapeutic categories	€bn
Care products (incl. stoma and wound management)	0.6
Diagnostics and imaging (including lab diagnostics and patient monitoring)	0.5
Ophthalmic (incl. implants, prostheses and glasses)	0.4
Cardiology (incl. prostheses and implants)	0.4
Orthopaedics (incl. prostheses and orthopaedic shoes)	0.3
In vitro diagnostics	0.3
General hospital and plastic surgery	0.3
Medical aids (incl. communication, signalling, food delivery, mobility, and arm-hand-finger function)	0.3
Dental	0.3
Ear, nose and throat (incl. hearing aids)	0.2
Drug delivery (incl. dialysis)	0.2
Diabetic care (incl. implants and prostheses)	0.1
Respiratory equipment	0.1
Home adaptation equipment/supplies	0.1
E-health home automation/robotics	0.1
Neurology	0.1
Endoscopy	0.1
Contraception (birth control)	0.0
Other	0.2
Total	**4.7**

Size of the medical technology market in 2016	
Patient care categories	€bn
Preventive care/self-care	0.1
General practitioner	0.1
Dentist	0.3
Pharmacy/medical specialty store	0.5
Optician	0.4
Audiologist	0.2
Gynaecology	0.0
Paramedical care	0.2
Independent treatment centre (ZBC)	0.1
Mental healthcare (GGZ)	0.0
Rehabilitation care	0.3
General hospital	0.9
Top clinical hospital	0.7
University hospital (incl. labs)	0.5
Nursing homes/home care (VVT) intramural	0.2
Nursing homes/home care (VVT) extramural	0.2
Total	**4.7**

Contents

Introduction and methodology

Introduction

Scope | Definition | Methodology | Sources

The scope of this study (page 9)

The scope of this study encompasses the entire medical technology market in the Netherlands. This includes both intra- and extramural medical technology and medical technology which is covered by basic health insurance (ZVW), the long-term care act (WLZ), municipality financed care (WMO) and privately financed care.

This study includes an overview of relevant actors and estimates of the size of the market as well as identifying trends that are impacting the medical technology market

MedTech definition used throughout this report (page 10)

The definition of MedTech used in this report is based on the EU Regulation on Medical Devices and includes all medical technology that is aimed at improving quality of care for patients (please refer to page 10 for more details).

The market values presented are based on the purchasing costs of the MedTech products that are incurred by the paying end-user, based on the sales prices of the manufacturer or wholesaler.

Method used in defining the market size (pages 11-17)

The therapeutic area – care provider matrix served as the basis for defining the size of the MedTech market in this report. The primary and secondary research conducted focused on determining the size of the MedTech market, its relevant actors and trends:

- In the first stage of the analysis, desk research was conducted to construct the therapeutic area – care provider matrix. In this analysis, existing sources were triangulated and assumptions were made in order to come to an initial set of insights on the market;
- In the second stage of the analysis, the findings of the first stage were tested and further analysed in an extensive interview programme among buyers, producers and representatives of industry associations;
- In the third stage of the analysis, findings were tested by the expert panel which comprised industry associations and experts.

Primary and secondary sources used in this report (page 18)

Primary sources used in this report consist of sector organisations, insurers, hospitals, private clinics and manufacturers/wholesalers.

Secondary sources used in this report comprise industry reports, analyst reports and other relevant reports in the medical technology sector.

Introduction and methodology

This report is designed to provide an independent view on the current size, structure and dynamics of the Dutch MedTech market

The questions which this report aims to answer as given by the ministry of VWS	
Scope item	
1	Which are the relevant actors in the Dutch MedTech market?
2	What is the value of the Dutch market for medical technology, both intra- and extramural, and both inside and outside the insured package?
3	What is the market share of the Dutch industry versus the European/global market?
4	What is the relationship between import and export of medical technology in the Netherlands?
5	What is the market share of SMEs versus big industry? Is there market dominance/are there economies of scale?
6	What are the profit margins for medical device manufacturers?
7	What developments have there been in both intra- and extramural medical technology? What is the explanation for the decrease/increase over recent years?
8	What is the relationship between medical technology used by care providers to treat patients, and used by patients themselves?
Trends	
1	What shifts and trends are observed in the care landscape? What role do care institutions, market players and patients play in this?
2	Are there trends towards a shift in in MedTech spending from intra- to extramural?
3	What trends can be observed in, for example, sales by a manufacturer directly to the patient, or by a manufacturer to a healthcare provider or by a provider to a healthcare institution?
4	Trends in an international context.

Introduction and methodology

The definition of MedTech is based on the definition in the EU Medical Devices Regulation

What is medical technology?

Medical technology can be considered as any technology that is used to save and improve the quality of lives.

- The medical technology category ranges from everyday objects such as sticking plasters, syringes and wheelchairs to hip and knee replacement joints and advanced medical systems such as total body scanners(1).
- The added value of medical technology is that it has a beneficial effect on the patient's quality of life. Advancements in medical technology have a positive effect of prolonging human life.
- There are currently over 500,000 different types of medical devices.

Definition of medical technology used in this report

The definition of medical technology used in this report is based on the EU Regulation on Medical Devices, which defines a medical device as follows:

> "'medical device' means any instrument, apparatus, appliance, software, implant, reagent, material or other article intended by the manufacturer to be used, alone or in combination, for human beings for one or more of the following specific medical purposes:
> - diagnosis, prevention, monitoring, prediction, prognosis, treatment or alleviation of disease,
> - diagnosis, monitoring, treatment, alleviation of, or compensation for, an injury or disability,
> - investigation, replacement or modification of the anatomy or of a physiological or pathological process or state,
> - providing information by means of in vitro examination of specimens derived from the human body, including organ, blood and tissue donations,
>
> and which does not achieve its principal intended action by pharmacological, immunological or metabolic means, in or on the human body, but which may be assisted in its function by such means."

Demarcation of the market

To address the limits of this research, there are some elements that require specific denotation. Within the scope of this research falls:

- Medical technology that is used throughout the healthcare system. This includes care covered by basic health insurance (ZVW), the law on long-term care (WLZ), municipality financed care (WMO) and privately financed MedTech;
- Maintenance costs without the human factor of maintenance, e.g. spare parts for devices are included, whereas salaries for maintenance technicians are not;
- Medical technology used for research purposes including IVDs;
- E-health/home automation, as long as it falls within the definition of a medical device provided on the bottom left, e.g. prevention and monitoring software.

Among other items, the following fall outside the scope of this research:

- Costs incurred for hospital automation, e.g. electronic patient records (EPD), planning costs, workflow and other ICT costs;
- Staff costs for the operation and supervision of medical technology devices;
- Costs incurred for adjusting/modifying medical devices in hospitals;
- Maintenance costs with a human factor, e.g. maintenance contracts, third-party services and maintenance costs.

The market will be quantified based on the purchasing costs of the MedTech products that are incurred by the paying end-user, based on the sales prices of the manufacturer or wholesaler.

Source: (1) Eucomed, MedTech Europe.
Global Medical Devices Nomenclature (GMDN) Agency. European Parliament.

Introduction and methodology

This study in the context of other studies on MedTech in the Dutch market

This study compared to other studies concerning the Dutch MedTech market

The complex and broad nature of the medical technology market and the varying interpretations of the definition of MedTech make it difficult to identify an overall market value for the Dutch market. Data availability is scarce and secondary research often differs in terms of the scope and definition used.

There have been a number of studies/publications aimed at determining the value of the Dutch MedTech market, all of which had different scopes and methodologies (Ecorys 2011(1), ING 2012(2), Gupta 2017(3), Ecorys 2017(4)). However only a few studies attempted to value both the intramural and extramural market (MedTech Europe, 2015(5) in terms of manufacturing prices).

Ecorys (2011) and ING (2012) both attempted to document the intramural medical technology market along the axes of medical equipment, medical disposables, prostheses and implants, and medical instruments. The data in these reports was gathered through interviews and reported healthcare costs (Ecorys) and using GlobalData (ING). These studies both valued the intramural market at roughly €2.4bn (2016 prices).

The scope and definition used in the MedTech Europe report (2015) comprised both the intramural and extramural medical technology market in terms of manufacturing prices. Therefore the scope of that study is closest to the scope used in this report. The market size (roughly €4.4bn in 2016 prices) was estimated based on available sources and interviews with industry associations.

The most recent publications by Gupta (2017) and Ecorys (2017) both focused on the intramural market. Gupta valued the market in 2016 primarily based on purchasing costs of hospitals (using data obtained from annual reports) and an assumption of the MedTech percentage in the categories of diagnostics, implants, medical disposables and medical technology. This report valued the intramural market at €2.7bn in 2016. In its latest report, Ecorys used a similar method to determine the market size as the one used in 2011, and valued the intramural market at €3.2bn in 2016.

Method used in this report

In this study, both the intramural and extramural market are valued based on a combination of primary and secondary sources. This report does not use any single approach (for example a percentage of healthcare costs as used by Ecorys), but uses multiple verification stages and research sources to determine the market value of MedTech in the Netherlands (see page 18 for sources used). This approach has been applied as detailed secondary research and data sources around medical technology are limited. Therefore, this report estimates the market along the detailed therapeutic areas – care category matrix (see next pages for more details), which is based on secondary research and verified through an extensive interview programme (35+ interviews) and expert panel meetings.

Limitations of the method used in this report

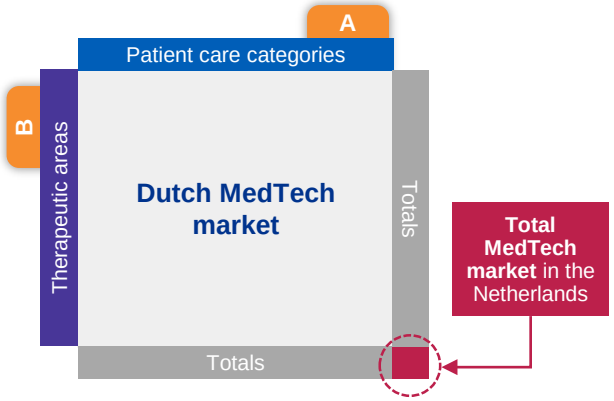
There are a number of limitations to the method that was used in this report. Firstly, the available secondary data was often only available on a highly aggregated level, which meant that certain assumptions were needed in order to estimate MedTech spending. Secondly, although controlled for, the usage of various data sources could potentially lead to a slight overlap of costs in some buckets. Thirdly, because they tend to lack conclusive data, industry associations, producers/wholesalers, insurers and hospitals were only able to provide a detailed view on the market value of their respective segments to a limited extent.

Source:
(1) Ecorys, 2011, 'Sectorstudie medische hulpmiddelen.
(2) ING, 2012, 'Sectorstudie Medische Apparatuur'.
(3) Gupta Strategists, 2017, 'Waardegedreven inkoop'.
(4) Ecorys, 2017 'De waarde van zorgtechnologie'.
(5) MedTech Europe, 2015, 'The European Medical Technology industry'.

Introduction and methodology

The size of the Dutch medical technology industry is estimated along the therapeutic area – care category matrix

Therapeutic area – care category matrix



The therapeutic area – care category matrix served as the basis for evaluating the size of the MedTech market in this report. The primary and secondary research that was conducted focused on these categories to analyse the size of the MedTech markets, its relevant actors and trends.

A. Patient care categories (pages 13-16)

The patient care categories are designed in a way that reflects the largest care categories in the Dutch healthcare system. The broad categories are; preventive care, primary care, secondary care, tertiary care and long-term care

These broad ranges are subdivided into smaller categories that aim to reflect the way in which medical technology reaches the end user, which could be either a patient or care institution.

B. Therapeutic areas (page 17)

The therapeutic areas aim to reflect the areas in which medical technology is present within the patient care categories, both intramural and extramural.

The therapeutic areas reflect treatment categories in which MedTech is used by either a care provider (i.e. an institution) or a patient.

Determining the market size

In determining the size of the medical technology market in the Netherlands, a combination of primary and secondary sources is used.

First stage – desk research

In the first stage of the analysis, desk research was conducted to construct the therapeutic area – care provider matrix. In this analysis, existing sources were triangulated and assumptions were made in order to come to an initial set of insights about the market.

An estimate of the market size is made for the patient care categories and the therapeutic areas in order to test these assumptions separately.

Data from prior reports, the Central Bureau for Statistics (CBS), industry data/research and annual reports of institutions were analysed and plotted along the patient care categories and therapeutic area axes.

Second stage – interview phase

In the second stage, an extensive interview programme was conducted consisting of more than 35 interviews. These interviews served to validate and test the market size and trend hypotheses of the first phase. The interview programme was focused on the size and trends in the individual markets across both the patient care categories and the therapeutic areas.

The assumptions for the sub-categories were tested with care institutions, insurance companies, market experts and industry associations.

Third stage – feedback phase

The main findings of the first two phases were consolidated and further analysed in order to reach a concluding report of draft findings that was shared among the members of the expert panel comprising representatives from industry associations.

Based on these discussions, the matrix and identified trends were investigated further and adjusted where necessary before finalisation.

Introduction and methodology

Distinct specialised care providers operate in different patient care categories

Patient care categories				
Self-care/preventive care	Primary care	Secondary care	Tertiary care	Long-term care
				
Preventive care is aimed at preventing diseases and increasing the general health of the population. In order to reduce costs in the healthcare sector and improve the quality of life, preventive care is attracting increasing attention.	Primary care refers to all care that is accessible for all patients without restrictions. The general practitioner (GP) generally has a central role as primary care provider. The GP determines care needs and may refer patients on for specialist care i.e. secondary/tertiary care if necessary. Other primary care providers include dentists, opticians, audiologists as discussed on the following page.	This comprises all care needing a GP referral. Generally these referrals are to specialists in hospitals or clinics. Rehabilitation and mental healthcare are also included here. In general, a patient can not get treatment in this category without a referral.	Tertiary care includes experts in an academic hospital and specialised laboratories. This type of care includes medical specialties that support secondary healthcare providers.	Long-term care refers to nursing homes, home care and other types of care that happen outside the hospital and tend to have a longer duration, it is sub-divided into intra- and extramural care.

Introduction and methodology

MedTech has a distinct role in the activities of each care provider in the patient care categories (1)

Patient care categories		
Category	**Role**	**Care provider types**
Self-care/preventive care	This category emphasises disease prevention. Preventive care includes healthcare education, hygiene in food preparation and compliance with safety regulations for disease prevention.	The most important care providers in self-care/preventive care using MedTech are: — Family carers (caregiving): Caregiving could be provided by family members or other close relatives. They provide daily assistance to ensure that the activities of daily living are possible; — Health agencies (e.g. the Dutch municipal or common health service (GGD)): Health agencies provide healthcare and hygiene education in the Netherlands. They try to create awareness around healthcare, e.g. sexually transmitted diseases, dangers of obesity; — Private purchasers: Medical technology can also be purchased prior to consulting a formal institution (municipality/hospital or other).
Primary care	Primary care includes GPs, pharmacists, dentists and others. GPs play a central role in the healthcare system in the Netherlands and act as 'gatekeepers' in that they examine patients and determine whether specialist care is necessary.	The most important care provider segments using MedTech in primary care are: — GPs: General practitioners are the first point of contact for healthcare in the Netherlands and can provide referrals to all medical specialists; — Dentists: Dental care includes dental prostheses, braces and other dental care; — Pharmacy/medical specialty stores: Pharmacies/specialty stores distribute medical products and medicines that are not always prescribed/recommended by the care provider; — Opticians: An optician is a practitioner who designs, fits and dispenses corrective lenses for the correction of a person's vision. Opticians determine the specifications of various ophthalmic appliances to correct a person's eyesight; — Audiologists: An audiologist is a healthcare professional specialising in identifying, diagnosing, treating and monitoring disorders of the auditory and vestibular systems in the ear; — Gynaecology and obstetrics care providers: This field concentrates on pregnancy, childbirth and the postpartum period; — Paramedic care providers: Paramedic care is aimed at reducing the functional consequences of a disease or condition. A GP can refer patients for paramedic care such as occupational therapy, physiotherapy and speech therapy.

Introduction and methodology

MedTech has a distinct role in the activities of each care provider in the patient care categories (2)

Patient care categories		
Category	**Role**	**Care provider types**
Secondary care	A patient who has been provided with primary care may be referred to a secondary care professional. Secondary care includes acute care: necessary treatment for a short period of time for a brief but serious illness, injury or other health condition, such as in a hospital emergency department. These are consultant-led services which include psychology, psychiatry and orthopaedics. Secondary care is usually but not always delivered in a hospital/clinic with the initial referral being made by the primary care professional.	The most important care providers in secondary care using MedTech are: — General hospitals: A hospital is a healthcare institution providing patient treatment with medical equipment and specialised medical and nursing staff; — Top clinical hospital: A hospital that distinguishes itself from general hospitals by always choosing the forefront position with patient-oriented scientific research, top-level care and education. It often has a specific medical specialty area; — Academic hospitals also offer less complex care, however in order to exclude double counting, in this study academic hospitals are accounted for in tertiary care; — Independent treatment centres are private clinics. They perform common elective i.e. non-emergency, surgery as well as diagnostic procedures and tests. Common treatments at an independent treatment centre include hip replacements, cataract operations or MRI scans rather than more complex operations like neurosurgery; — Mental healthcare: Mental healthcare providers offer counselling, treatment and support to people with different mental health problems or psychiatric disorders such as anxiety disorders, depression, addiction, aggression or schizophrenia; — Rehabilitation care: Rehabilitation care is a treatment designed to facilitate the process of recovery from injury, illness or disease to as normal a condition as possible. The purpose of rehabilitation is to restore some or all of the patient's physical, sensory and mental capabilities that were lost owing to injury, illness, or disease.

Introduction and methodology

MedTech has a distinct role in the activities of each care provider in the patient care categories (3)

Patient care categories		
Category	**Role**	**Care provider types**
Tertiary care	Once a patient is hospitalised, they may require highly specialised treatment and care within the hospital. Tertiary care requires professionals, usually surgeons with specific expertise in a given field, to carry out investigation and treatment for the patient.	The most important care providers in tertiary care using MedTech are: — Academic hospitals: Academic hospitals can provide highly specialised treatments. Examples of tertiary care services are cancer management, neurosurgery, cardiac surgery, plastic surgery, treatment for severe burns, and other complex medical or surgical interventions; — Top clinical hospitals also offer complex care, however in order to exclude double counting, in this study top clinical hospitals are accounted for in secondary care.
Long-term care	Long-term care includes nursing homes, care at home and other types of care that happen outside the hospital and tend to be more long-term.	The most important care providers in long-term care using MedTech are: — Intramural and extramural VVT care providers: Intramural refers to nursing homes, which are a type of residential care that provides around-the-clock nursing care for elderly people and other persons in need of long-term care. Extramural refers to home care, which is care given at the homes of elderly people or people who need special care e.g. after intramural treatment.

Introduction and methodology

Usage of MedTech has been divided into 17 defined therapeutic areas

Therapeutic areas identified		
	Therapeutic area	Description
1	Care products	Medical products incl. stoma, incontinence materials and wound management materials
2	Diagnostics and imaging	Diagnostics, imaging systems including patient monitoring
3	Ophthalmic	Visual aids including lens implants and glasses
4	Cardiology	Medical technology related to cardiology procedures incl. prostheses and implants
5	In vitro diagnostics	In vitro diagnostics are tests that can detect diseases, conditions, or infections
6	Orthopaedics	Orthopaedic-related MedTech such as implants, prostheses and orthopaedic shoes
7	General hospital and plastic surgery	General hospital and plastic surgery medical equipment including tools, disposables
8	Ear, nose and throat	ENT MedTech including hearing implants, hearing aids and ear irrigation equipment
9	Diabetic care	Includes disposables (test-strips) and equipment e.g. insulin pumps, injection equipment
10	Drug delivery	MedTech used for transporting pharmaceutical compounds into the body incl. dialysis
11	Respiratory equipment	MedTech equipment such as oxygen machines and CPAP equipment
12	Home altering elements	Home altering elements needed to assist people with a disability in their everyday lives
13	E-health/home automation/robotics	E-health/home automation/robotics equipment classified solely as MedTech
14	Dental	MedTech used in dental procedures, including disposables, prostheses and implants
15	Neurology	Medical technology used in neurology diagnosis and analysis
16	Medical aids	MedTech that supports daily functioning of the patient including communication, signalling, food delivery, mobility aids, and arm-hand-finger function
17	Endoscopy	Equipment used to look inside the body
	Other	Other MedTech which is not specified in the above categories

Source: KPMG analysis, GIP Peilingen, GlobalData (medical equipment).

The Dutch medical technology market

The MedTech market can be categorised into two main streams – medical devices and in vitro diagnostics.

Medical device market [2-4, 6-17]

The medical device market denotes any instrument, apparatus, appliance, software, material or other article, whether used alone or in combination, including the software intended by its manufacturer to be used specifically for diagnostic and/or therapeutic purposes. This includes:

- Prevention, diagnosis, monitoring, treatment or alleviation of disease;
- Diagnosis, monitoring, treatment, alleviation of or compensation for an injury or handicap;
- Investigation, replacement or modification of the anatomy or of a physiological process;
- Control of conception.

In this report, we identified 17 therapeutic areas (and a category ‘other’).

In vitro diagnostics [5]

The in vitro diagnostics market is characterised by any medical device which is a reagent, reagent product, calibrator, control material, kit, instrument, apparatus, equipment or system, intended by the manufacturer to be used for the examination of specimens, including blood and tissue donations, derived from the human body, solely or principally for the purpose of providing information.

Introduction and methodology

Data presented in this report is based on an extensive interview programme, secondary research and expert panel meetings

Sources used in this report

Primary sources (interviews)

Sector organisations
- Actiz
- Dekra
- Diagned
- DVN
- Ergotherapie NL
- NVVC
- FHI
- Firevaned
- LHV
- Nefemed
- Nefrovisie
- Neprofarm
- NFU
- Nuvo
- NVAB (kindhoren)
- NVMBR
- Revalidatiezorg NL
- TFHS
- TNO
- VGN

Health insurers
- CZ
- VGZ

Hospitals
- General hospital (1)
- General hospital (2)
- General hospital (3)
- Top clinical hospital (1)
- Top clinical hospital (2)
- Top clinical hospital (3)
- Academic hospital (1)
- Academic hospital (2)
- Academic hospital (3)

Producers/wholesalers
- Draeger
- Medux/Hartigbank
- Orthopaedic manufacturer
- Sensara
- Siemens Healthcare

Secondary sources
- NVZ Ziekenhuizen
- Rabobank 'Sector rapport medische technology'
- Gupta, 2017 'Waardegedreven inkoop'
- Zorgcijfer databank
- ING, 2012 'Sectorstudie medische apparatuur'
- Farmacotherapeutischkompas
- GlobalData (Medical Equipment)
- GIP Peilingen
- EvaluateMedTech
- Euromed
- EY 'Pulse of the Industry, 2017'
- MedTech Europe
- Zorginstituut Nederland
- KPMG Nieuwe bekostiging eerstelijnsdiagnostiek
- KPMG Lifesciences and healthcare briefing
- Global Medical Devices Nomenclature Agency
- Ecorys, reports on MedTech 2011, 2017
- CBS
- Emergo Group, EHCI, 2016
- Capital IQ
- Annual reports
- Company websites
- Germany Trade & invest
- MedTechEngine
- PharmaField
- Intrakoop

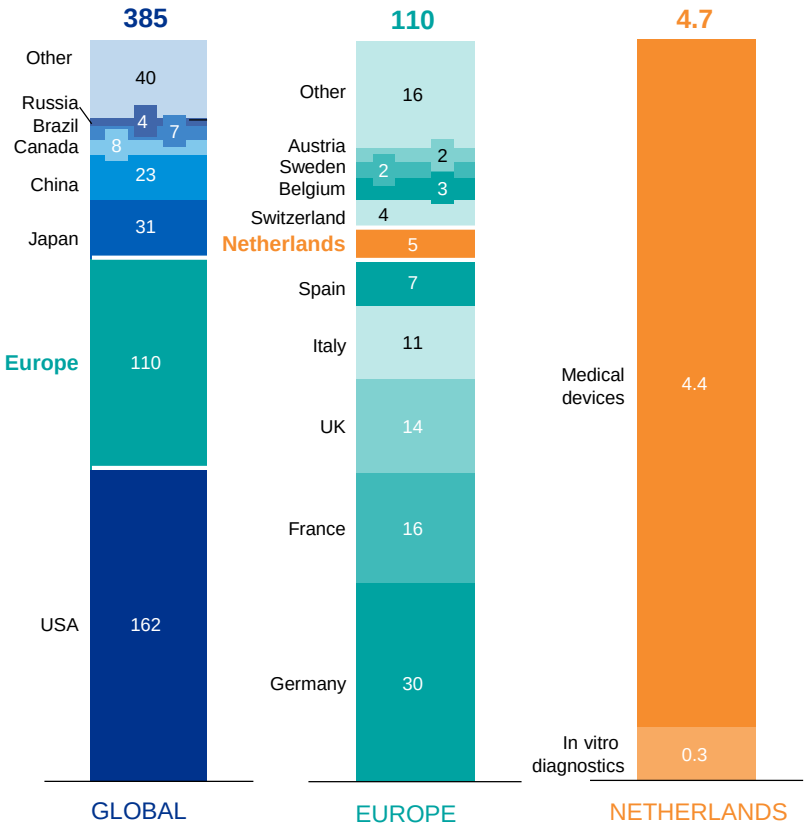
Expert panel
- Dekra
- Diagned
- FHI
- Firevaned
- FME
- FMS
- Nefemed
- NVZ
- Patiënten federatie
- VWS
- ZKN

The MedTech market in the Netherlands

The MedTech market in the Netherlands

The Dutch MedTech market is estimated at >1% of the global market value and about 4%-5% of the EU value, estimated at €4.7bn in 2016

Medical technology market, 2016 (in €bn)



Source: Eucomed, EvaluateMedTech, KPMG analysis.

World market

The world MedTech market is estimated at €385bn[(1)] in 2016 and the largest market is the US, followed by Europe and Japan. The largest company in the MedTech industry is Medtronic, with sales of €25bn[(2)] in 2016.

Europe

The European MedTech market is estimated at €110bn[(1)] in 2016, with the largest European producer being Siemens (€15bn) in Germany, followed by Philips (€13bn) in the Netherlands.

European healthcare systems are largely financed through payroll taxes or general taxation, making it a highly regulated market in terms of prices and quality. Demand in the region is strong, as Europe's population is aging faster than the world average.

The Netherlands

The Dutch MedTech market is estimated at €4.7bn in 2016, based on manufacturing and wholesale prices. The Dutch healthcare system is considered to be one of the best in Europe[3] and the Netherlands is a major hub in the European MedTech market.

The MedTech market in the Netherlands makes up a relatively small portion (approximately 4%) of the European market and 1% of the global market. However the Dutch MedTech market is among the more advanced markets in Europe, and Dutch manufacturers compete with European and global players in both the national and international markets.

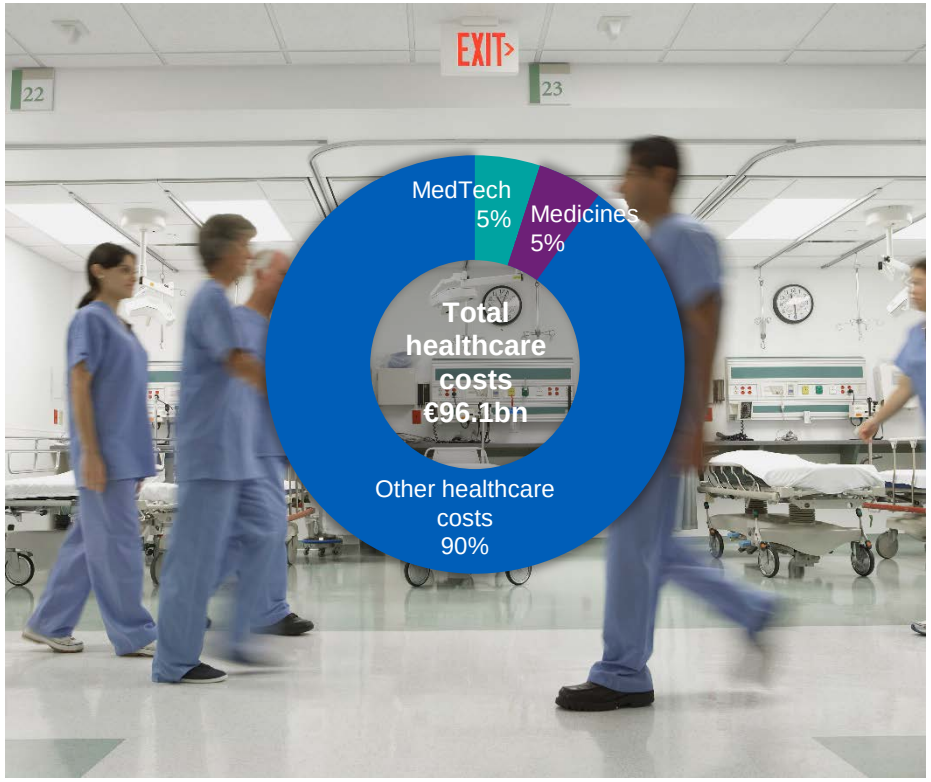
The Dutch MedTech market is expected to grow going forward as a result of, among other factors, 1) wider adoption of medical technology in everyday lives, 2) advancements in technology that enable us to detect diseases at an early stage, 3) substitution of labour with technology.

Source: (1) EvaluateMedTech.
(2) Eucomed.
(3) EHCI.

The MedTech market in the Netherlands

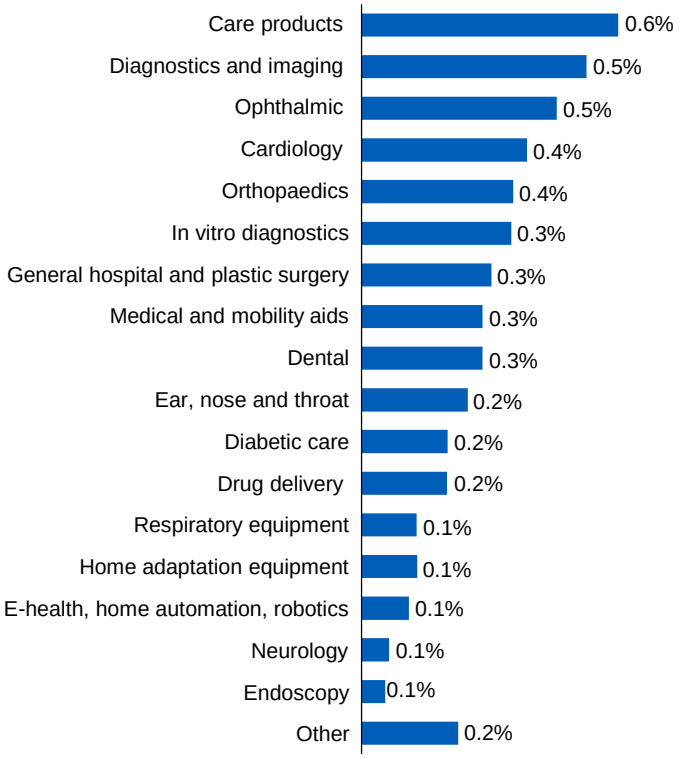
MedTech and medicines spending in the Netherlands are both estimated at roughly 5% of the total healthcare spending in 2016

Medical technology and medicines as a proportion of total healthcare spending in the Netherlands, 2016



Source: CBS, Medicijnmonitor, 2017, KPMG analysis.

Therapeutic areas as a percentage of total healthcare spending

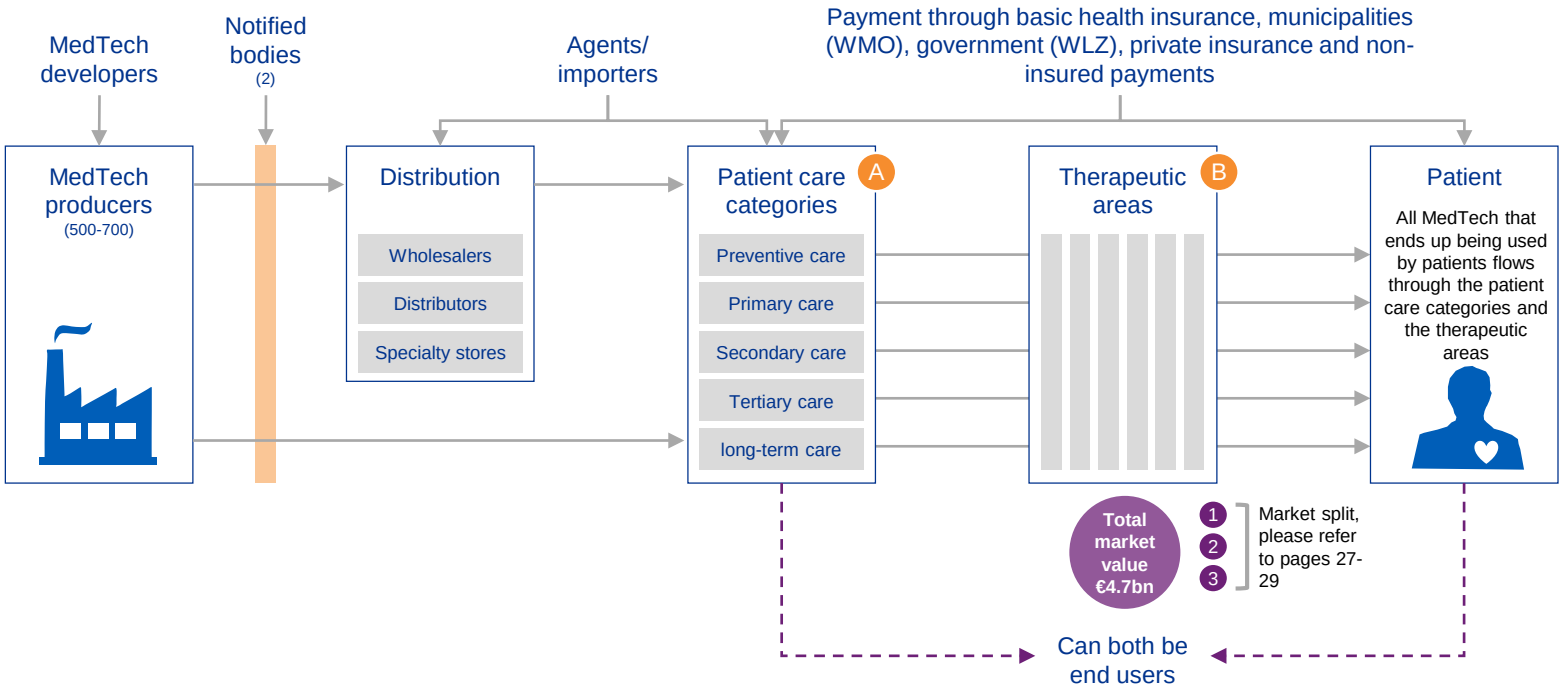


Source: CBS, KPMG analysis.

The MedTech market in the Netherlands

The value chain of the Dutch MedTech system comprises many actors

The value chain of the Dutch MedTech system



Note: There are two notified bodies for certification: DEKRA certification and DARE!! Medical certifications.

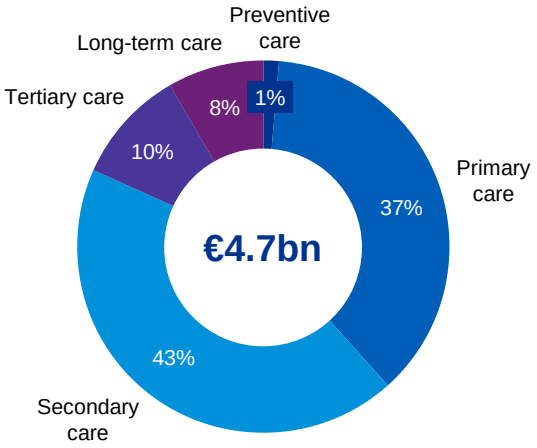
Key: A Patient care category B Therapeutic areas
1 Intra/extramural MedTech 2 Insured/non-insured MedTech 3 Used by care provider/patient
(x) Number of actors active

The MedTech market in the Netherlands

The largest share of the Dutch healthcare budget is spent on secondary care technology

The Dutch MedTech market along the patient care category axis

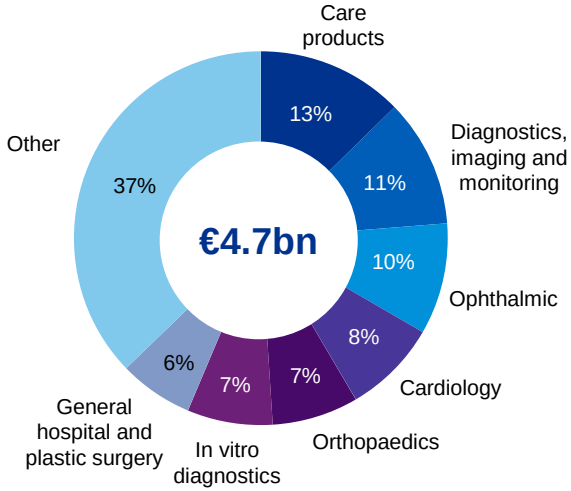
A



Note: Please see page 24 for more details on the patient care categories.
Source: KPMG analysis.

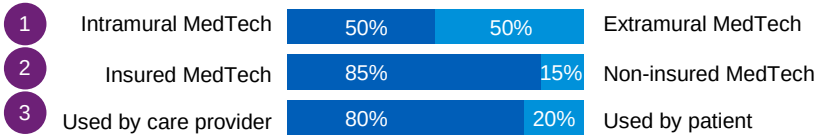
The Dutch MedTech market along the therapeutic areas axis

B



Note: Please see pages 25-26 for more details on the patient care categories.
Source: KPMG analysis.

Further market split estimates

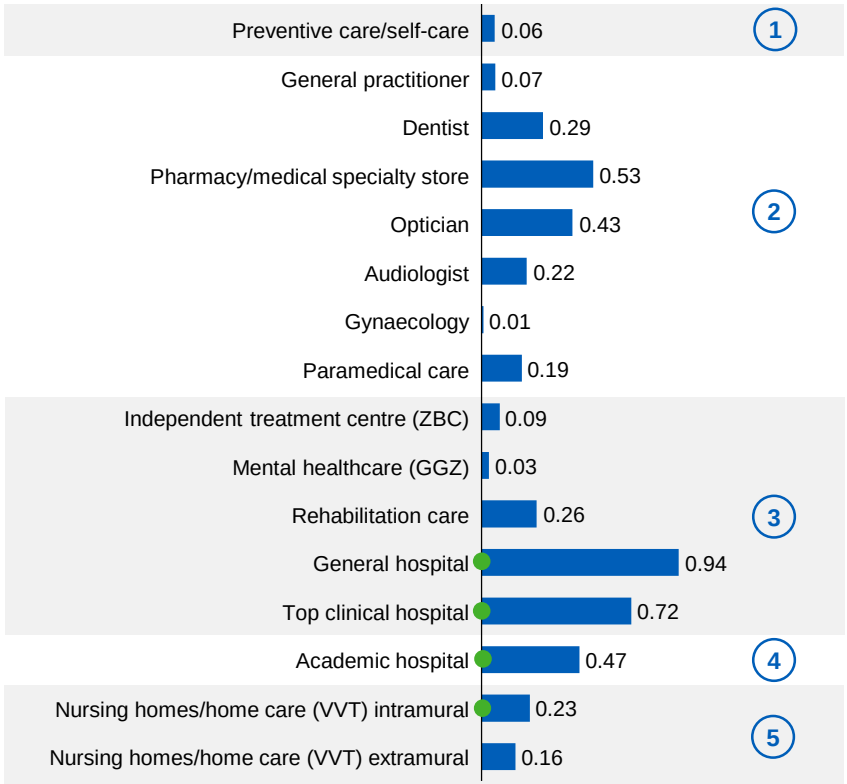


Source: KPMG analysis, interview feedback.

The MedTech market in the Netherlands

MedTech spending tends to increase in line with the complexity or duration of illnesses

The Dutch MedTech market along the patient care category axis (in €bn)



Key: Included in the intramural medical technology market.
Source: KPMG analysis.

Comments

1. Preventive care: MedTech in preventive care is currently at an early stage. Companies like Google, Apple and also start-ups facilitate and create apps that are specifically designed to detect potential medical issues through algorithms in phones and wearables. Also 'smart homes' for elderly and disabled people are used for preventive purposes.

2. Primary care: In primary care, MedTech can be found in for example care products, including stoma and wound management, and diabetic care essentials and other care products distributed through pharmacies and medical specialty stores. In addition, a large portion of MedTech spending is within the visual aids category that is distributed through opticians and includes glasses and lenses, as well as hearing aids and MedTech used in paramedical care.

3. Secondary care: In secondary care, hospitals are the most prominent MedTech users, with capital-intensive medical technology that is used for diagnostics and imaging, including lab diagnostics and patient monitoring, as well as other MedTech such as disposables and cardiology equipment including prostheses and implants. MedTech in secondary care also includes all medical aids used in rehabilitation care and other treatment centres.

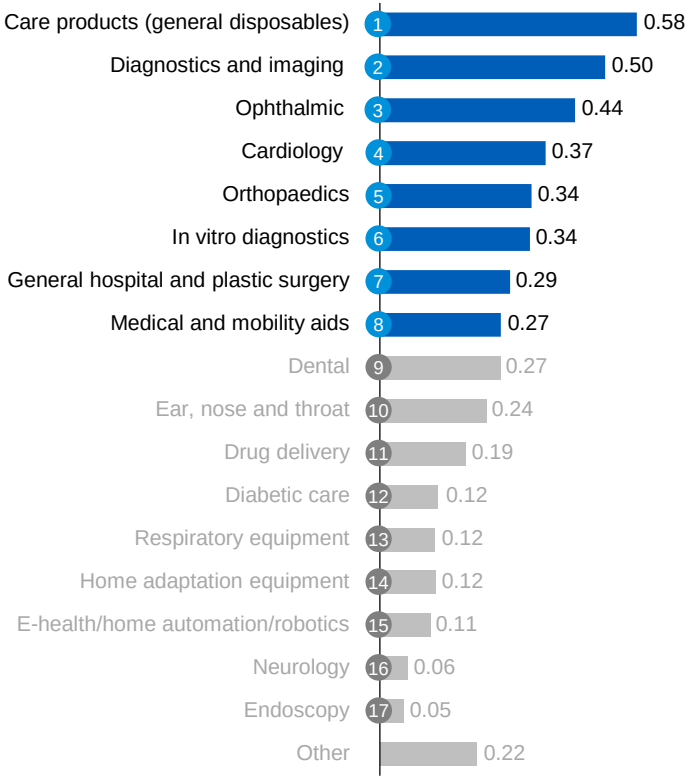
4. Tertiary care: Academic hospitals tend to acquire the most high-end medical technology and usually cooperate with large suppliers to develop and improve the medical technology used in capital-intensive devices. Academic hospitals tend to use the latest diagnostic and imaging equipment, including lab diagnostics and patient monitoring, as well as high-end disposable equipment and technologies.

5.Long-term care: In long-term care, medical technology includes respiratory equipment, home automation, home altering elements and medical aids, such as for communication or mobility. Home automation is expected to play a larger role in the future as the Dutch population is ageing.

The MedTech market in the Netherlands

The Dutch MedTech market along the therapeutic treatment area axis (1)

The Dutch MedTech market along the therapeutic area axis (in €bn)



Source: KPMG analysis.

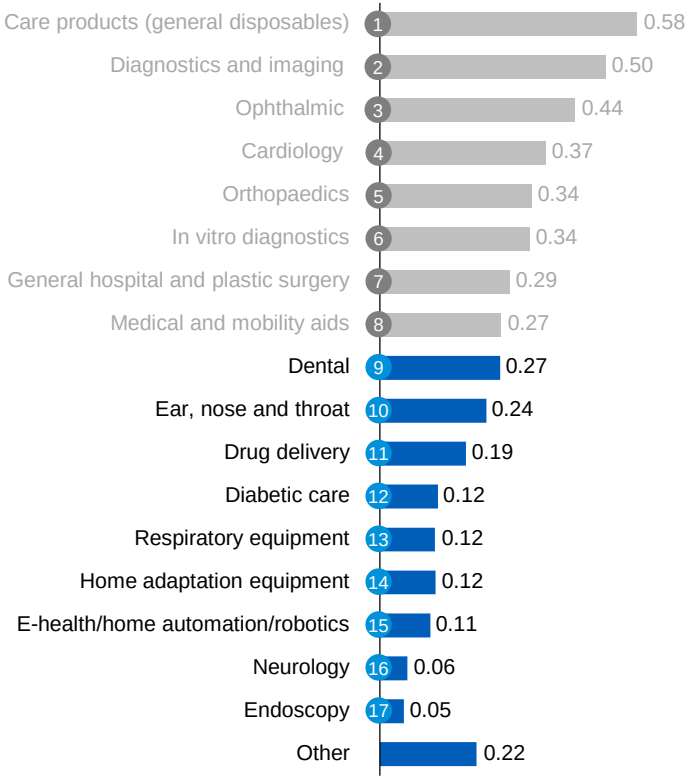
Comments

1. The care products segment is broad and mostly includes disposable items such as stoma care supplies, incontinence materials, catheters and wound management materials.
2. Approximately 70% of the diagnostics and imaging therapeutic area comprises apparatus for diagnostic and imaging purposes; other categories within this segment include patient monitoring equipment. Imaging equipment is also used in other therapeutic areas such as cardiology.
3. Ophthalmic includes specialty glasses for the visually impaired as well as regular glasses and lenses. This is measured using manufacturers' prices and excludes costs for aesthetics, consulting and other costs related to the sale of visual aids. Implants and prostheses are also included in this category.
4. MedTech in cardiology includes implants and prostheses used in cardiology-related procedures as well as diagnostic apparatus and disposables that are specifically utilised in cardiology-related procedures.
5. The orthopaedics category includes orthopaedic-related medical technology such as implants and prostheses as well as orthopaedic shoes.
6. The market for in vitro diagnostics consists of all the lab equipment and disposables needed to perform tests for the purpose of detecting diseases, conditions or infections. Also included is self-measuring equipment for blood clotting times.
7. General and plastic surgery medical equipment includes tools, disposables and implants used in general and plastic surgery procedures.
8. Medical aids include aids for communication, signalling, food delivery, mobility (e.g. wheelchairs and automatic wheelchairs) and arm-hand-finger functions.

The MedTech market in the Netherlands

The Dutch MedTech market along the therapeutic treatment area axis (2)

The Dutch MedTech market along the therapeutic area axis (in €bn)



Source: KPMG analysis.

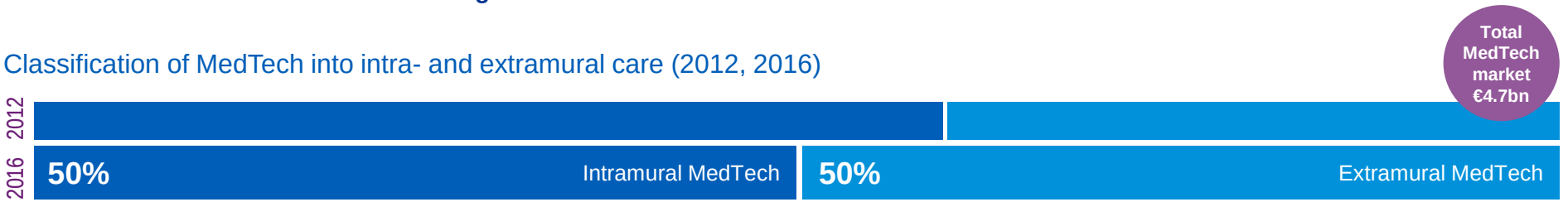
Comments

9. Dental MedTech includes the medical technology needed in dental procedures such as disposables, prostheses and implants.
10. Ear, nose and throat mostly consists of hearing implants, hearing aids and ear irrigation equipment.
11. Drug delivery equipment includes all systems used for transporting pharmaceutical compounds into the body, including dialysis and resources related to treatment where drug delivery is needed.
12. Diabetic care medical equipment mostly consists of disposables and equipment such as insulin pumps and injection equipment.
13. Respiratory equipment includes medical equipment such as oxygen machines and continuous positive airway pressure (CPAP) equipment.
14. Home-altering elements include medical technology that is needed for caring for bedridden patients as well as medical technology that is needed to assist people with a disability in their everyday lives.
15. E-health/home automation/robotics are mostly used in preventive care, mental healthcare and long-term care/home care. This segment is still relatively small but is increasing rapidly.
16. Neurology includes medical applications and technologies related to the treatment of neurological procedures and diagnosis.
17. Endoscopy medical equipment is used to look inside the body and perform surgery without making large incisions.

The MedTech market in the Netherlands

The intramural market seems to be as large as the extramural market

Classification of MedTech into intra- and extramural care (2012, 2016)



Source: Interview feedback, KPMG analysis.

MedTech in intramural care

Most capital-intensive medical technology spending occurs intramurally in hospitals or nursing homes. This is due to the complexity of intramural treatments and corresponding MedTech requirements, as well as the quality of the technology that is invested in.

— Large complex MedTech systems such as PET and MRI scanners are often very expensive and need to be operated by trained staff in a hospital environment. Therefore, most large complex medical technological systems are present in academic and general hospitals in contrast with elderly care institutions where it is mainly low-tech medical technology that is used. Additionally, hospitals also invest more in higher quality non-durable and disposable MedTech, which can increase the quality of treatment, but also the cost.

MedTech in extramural care

With the help of new medical technology and by organising care more efficiently, many types of treatments and care can be organised outside the hospital setting.

— Current technology allows a large amount of MedTech to be used outside of the hospital setting and without specialist knowledge. This trend is expected to continue: software advancements improving the ease of use increasingly limit the need for direct specialist knowledge. By investing in digital care closer to the patient, care becomes more personalised for the individual resulting in higher-quality care.

— MedTech in extramural care also includes MedTech used in nursing homes (VVT), dental care, hearing care, visual aids, dentistry, general practice and independent treatment centres.

Trends and shifts

With a gradual shift in recent years (2012-2016) from intramural to extramural care, public health, nurses, nursing homes and rehabilitation centres are using much more technical care as treatments increasingly require the use of medical technology. In addition, patients are increasingly treated in the home environment for which new medical technology is being developed.

Advancements in medical technology make extramural care less complex with the help of integrated solutions. These solutions help extramural care providers such as GPs and caretakers in nursing homes to use MedTech that otherwise would require specialist knowledge.

In addition, a patient receiving long-term medical care can increasingly count on advancements in medical technologies and requires less intervention by intramural care providers.

Source: Interview feedback, KPMG analysis.

The MedTech market in the Netherlands

The largest part of MedTech spending in the Netherlands is covered by government institutions and health insurance

Classification of MedTech into insured and non-insured care (2012, 2016)

Source: Interview feedback, KPMG expert, KPMG analysis.

Insured MedTech

Health insurance is compulsory for all people who live or work in the Netherlands. Consequently, most MedTech used in intramural and extramural care, whether used by patients or hospitals, is covered by the Dutch basic health insurance system.

- Hospitals and treatment clinics typically get reimbursed for a specific treatment package, which is known as a DBC. The reimbursement fee includes an amount to cover depreciation of capital-intensive MedTech and the use of disposable MedTech.
- Most medical technology is covered by the Dutch basic health insurance system. The rest is covered by the relevant municipality (WMO), the long-term care act (WLZ), the law on special healthcare needs (AWBZ) and private health insurance.

Non-insured MedTech

Care without a medical need, for example cosmetic surgery or sterilisation, is not reimbursed by basic health insurance and consumers need to pay for these treatments themselves.

- Hospitals sometimes choose to invest in medical technology that is not covered by insurance, when the technology is considered to add value to a specific treatment. However, this only affects a very small portion of the care provided.
- Some low-end MedTech that is sold and distributed through pharmacies and drugstores is not insured, such as pregnancy tests and wound management items. Additionally, certain types of preventive and long-term-care-related medical technology are also not insured, as well as certain visual/hearing aids such as glasses and lenses.

Trends and shifts

In total, the percentage of total MedTech which is reimbursed is expected to grow slightly. This could be fuelled by a gradual shift from labour to technology. Additionally, there might be a slight shift towards more non-insured MedTech as the preventive market is growing and not yet (fully) reimbursed currently.

Health insurers employ cost-effectiveness analyses that determine whether the addition of a certain type of medical technology is cost efficient and contributes to the treatment before it is included in the basic health insurance cover.

Source: Interview feedback, CPB, KPMG analysis.

The MedTech market in the Netherlands

MedTech is still largely used by care providers owing to its complexity, but using smart tools to help patients interpret data may change this

Classification of MedTech into care provider use and patient/self-care use

Total MedTech market €4.7bn

Source: Interview feedback, KPMG expert, KPMG analysis.

Care provider use

Most MedTech is used by care providers in the Dutch market for the treatment of patients. Care providers use a wide range of medical technology from low to high tech.

In the case of intramural care in top clinical and academic hospitals, almost all MedTech is used by the care provider. Capital-intensive MedTech is mostly meant to be used by multiple patients, therefore it is the care provider that uses the MedTech to treat the patients.

Additionally, a portion of the extramural care is used by care providers, such as (parts of) dental and ophthalmic care products and home automation.

Patient use

Self-care seems to be used less in the Netherlands than in other countries in Europe because patients can be checked/tested by a general practitioner at relatively low cost. However, owing to factors including the 'own risk' contribution (i.e. patient excess or deductible) self-care is gradually increasing.

MedTech used by patients can be low-tech, such as mobility aids, home-altering products, care products, contraception etc., or high-tech, for example diabetic care instruments, home automation and e-health/e-monitoring applications.

This includes ophthalmic equipment, disposables, hearing aids and orthopaedics. Additionally, a small portion of intramural MedTech is intended for use by the patients themselves (rather than by healthcare providers), for example diabetic care instruments.

Trends and shifts

The consumer (patient) is increasingly using MedTech for health monitoring, self diagnostics and preventive purposes. Please see also trends on patient-data-sharing technologies (p.42) for more information about wearables.

A second trend is that medical technology is shared with patients to increase self-monitoring under the supervision of a healthcare provider. If diverging data is detected, the monitoring device can either signal the healthcare provider directly or tell the patient to go and see the care provider, for example in diabetic care.

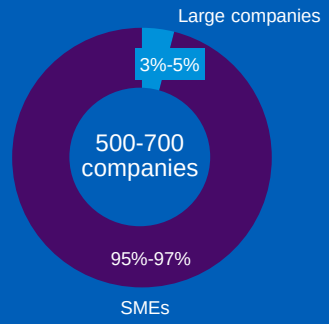
Source: KPMG expert, interview feedback.

Dutch MedTech companies

Dutch MedTech companies

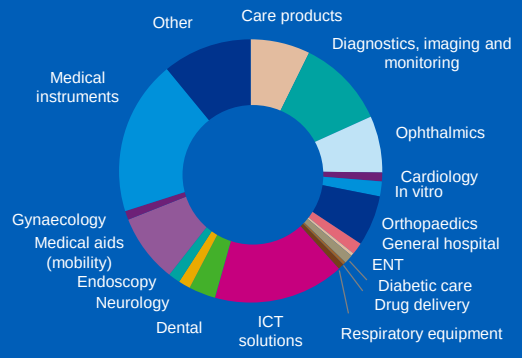
An estimated 500-700 companies are active in the Dutch MedTech market, 95%-97% of which are SMEs

Dutch MedTech landscape[(a)]



Note: (a) SME: <250 employees; large companies: >250 employees.
Source: Capital IQ, interview feedback, KPMG analysis.

MedTech landscape segmentation[(a)]



Note: (a) Sector estimate based on available information (n=300) and main activity.
Source: Capital IQ, interview feedback, KPMG analysis.

Most companies operating in the Dutch market are either small or medium-sized enterprises, or subsidiaries of large multinationals

There are some leading Dutch companies that are active on the international market in the field of diagnostic imaging.

— Other larger companies located in the Netherlands are mainly subsidiaries (roughly ten) of large multinationals.

The Dutch sector is characterised by a high level of cooperation that is enabled by the system's structure

SMEs are often motivated to work closely with care providers and academic institutions as innovation partners to develop new MedTech.

— A large portion of these SMEs are developing new innovative medical technology in e-health, patient monitoring and medical instruments.

— An example of incentivisation is the WBSO law, which is designed to keep personnel costs low in order to stimulate innovation. Also, in the Netherlands, the European standards for product design apply, meaning that a product with the CE mark will be immediately accepted in most international markets.

However, SMEs are increasingly looking outside the Dutch borders to grow their businesses.

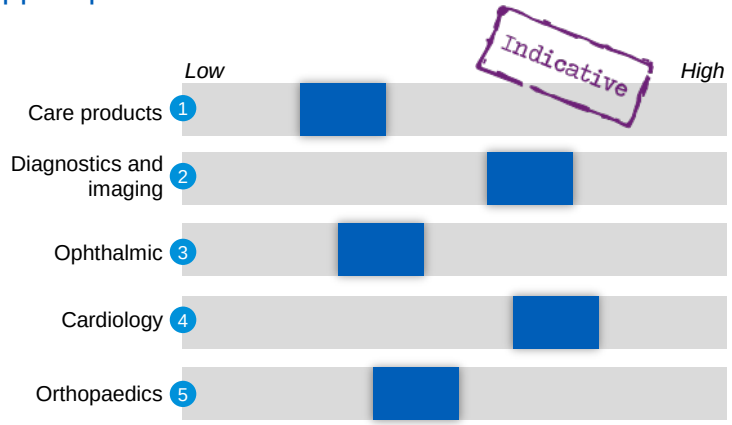
— The regulatory system and the ability to get new medical technology 'insured' is a time-consuming and difficult process, which often causes Dutch companies to look across borders for growth opportunities.

— The Dutch government invests substantial amounts in start-ups. However, investments in SMEs in the 'growth stage' seem to be limited.

Dutch MedTech companies

Supplier power seems to differ significantly among the five largest MedTech sectors

Supplier power in the Dutch MedTech market



Source: Intrakoop, 2017, interview feedback, Capital IQ, Intrakoop, KPMG analysis.

Comments

Supplier power seems to differ greatly among the different sectors. High-tech sectors such as diagnostics and imaging and cardiology tend to be led by large players because of the complexity and scale requirements.

1. The market for care products is broadly defined and a number of players are active on the market. The goods are typically low-tech and homogeneous. Market competitiveness is expected to be relatively high and market strength relatively low.
2. Supplier power in diagnostics and imaging seems high. Due to complex technology and scale requirements only a few large players are active in the Dutch market.
3. The ophthalmic market has a relatively large number of lens and glasses producers and also a relatively large number of opticians. Market power therefore seems to be relatively low.
4. A small number of large corporates dominate the cardiology market (three US companies have a 90% share of the global market).
5. There are a large number of producers of orthopaedic shoes/aids in the Netherlands. These consist of a small number of larger chains and smaller family-owned stores. This market seems to be very local, therefore supplier power still exists within the smaller market.

Purchasing power of hospitals

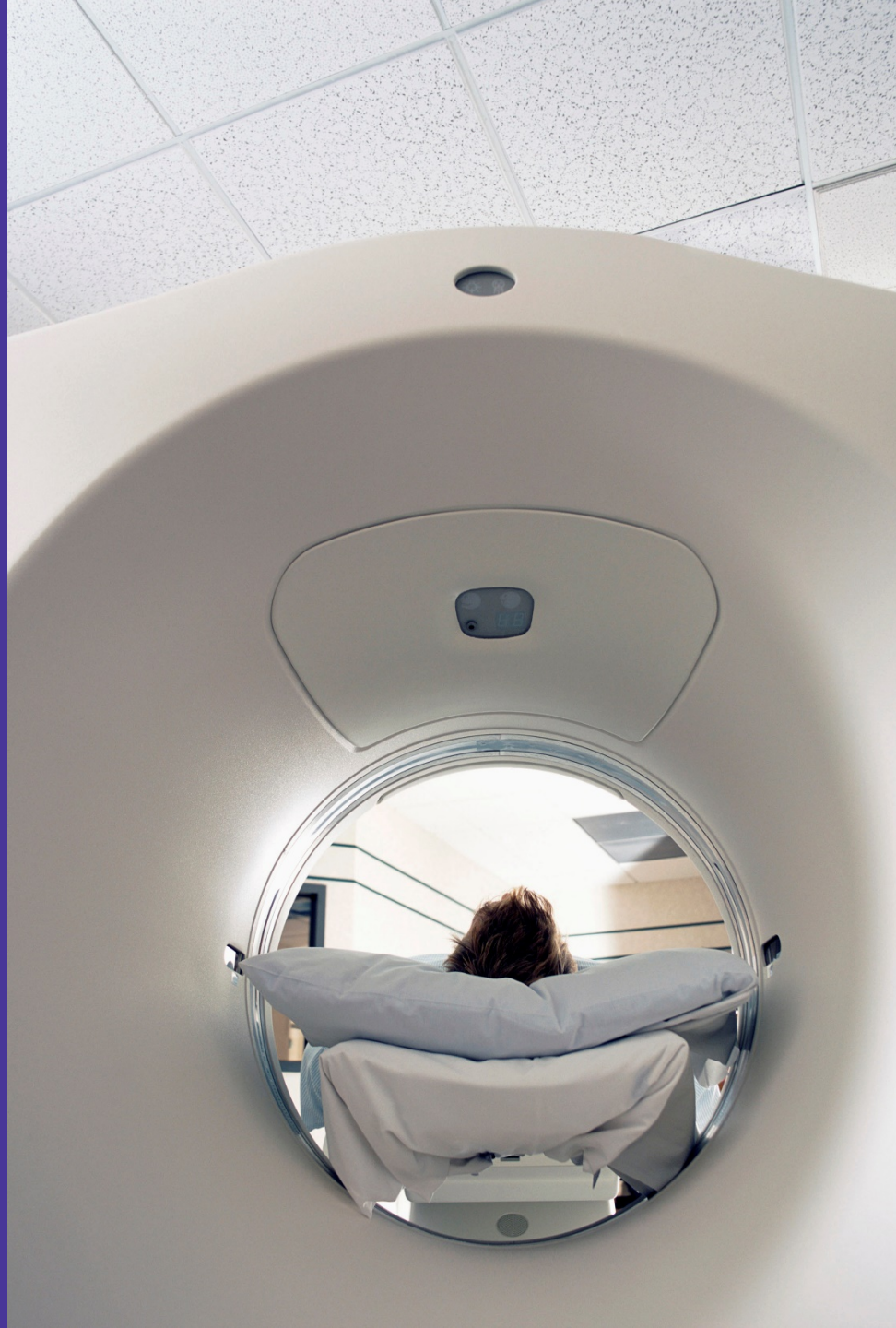
Large academic hospitals seem to prefer large suppliers or wholesalers that operate internationally as their main suppliers because of their track records on quality and ability to deliver.

Hospitals (or purchasing cooperatives) tend to choose a small number of wholesalers/producers as their main suppliers, often because of purchasing advantages and price reductions for volume buying.

However, cooperation between hospitals seems to be lacking in an international context (compared to Germany for example). The power to negotiate better prices in order to generate cost savings is mostly dependent on the level of supplier concentration within specific therapeutic or technological areas.[1]

Source: (1) Intrakoop, 2017.
Interview feedback, Capital IQ, Intrakoop, KPMG analysis.

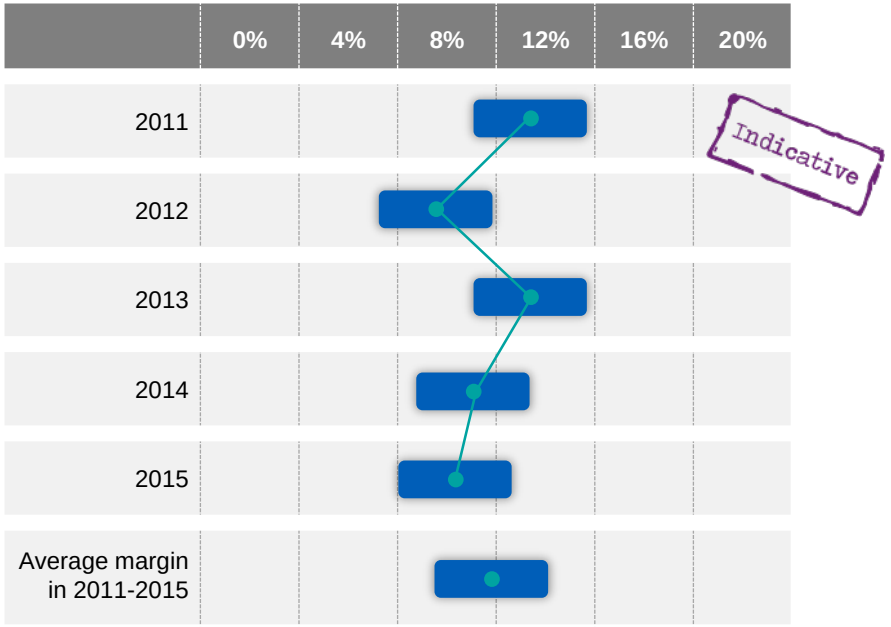
Margins in the Dutch MedTech sector



Margins in the Dutch MedTech sector

Profit margins of MedTech companies in the Dutch market were estimated at around 10% in 2015 and seem to have decreased slightly

EBIT margins in the Dutch MedTech sector, 2011-2015



Note: Based on available profit margin (EBIT) information of companies operating in the Netherlands.
n>24 companies per year.
Margin data points for 2016 were insufficient to reach a conclusion.

Source: Capital IQ, annual reports, KPMG analysis.

Limited data availability has resulted in a purely indicative estimate of MedTech profit margins

Limited data was available on profit margins of companies operating in the Dutch medical technology space as only few national and international MedTech producers publish profit data. Additionally, a large number of international players operating in the Dutch market do not publish margin data specifically for their Dutch divisions/subsidiaries. As a result, the analysis on the left is conducted based on a minimum of 24 annual reports for each year, and no distinction between subsectors could be made.

This approach differs from the approach used by Gupta (2017)(1) which resulted in a higher margin percentage (15%-20%). Gupta based its analysis on the average profit margins (EBIT) of five large suppliers of medical devices and/or equipment(1).

Profit margins for Dutch medical technology producers seem to have decreased slightly in the period 2011-2015

There are several potential reasons for a decreasing EBIT margin trend:

— Budget constraints: Budget constraints of hospitals can potentially lead to a decrease in MedTech purchasing. Some hospitals opt to postpone capital investments or downgrade the quality of purchases in order to comply with budget constraints;

— Competitive pressure: There is more competitive pressure in the market meaning that the negotiating position of purchasers is stronger.

— Pressure from health insurers: Health insurers exert pressure in terms of the pricing of new MedTech or decline to cover advancements in current medical technologies that offer the same sort of treatment but are often more expensive.

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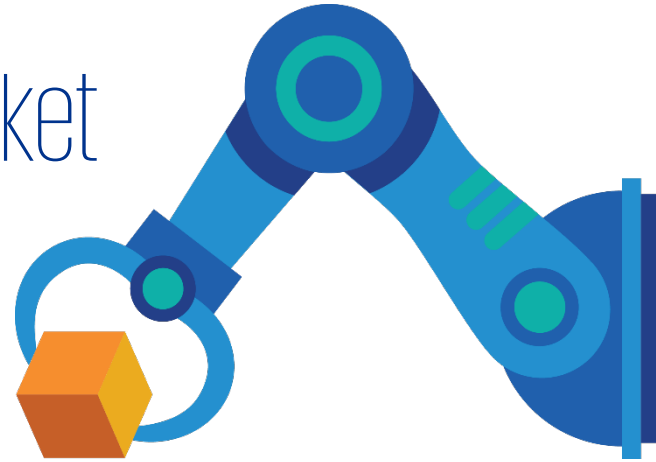
Source: (1) Gupta, 2017 ‘Ezeltje strekje’.

Trends impacting the Dutch MedTech market

Trends impacting the Dutch MedTech market



Dutch dynamics

MedTech supports the (expected) shifts in Dutch healthcare e.g. from intramural to the home environment, or from treatment to prevention

Major treatment area trends

Innovations in MedTech will increase precision, speed, personalisation, and automation of medicine, improving the outcomes for patients

E-health trends

E-health technologies enable seamless delivery of care, continuous access to patient data, and improved clinical decision-making

Business model trends

MedTech suppliers are gradually moving towards customer-centric business and service models such as value-based healthcare (VBHC) and managed equipment services

Manufacturing and supply chain trends

The traditional supply chain models are expected to be disrupted by the Internet of Things (IoT), direct-to-consumer supply and customer inventory management systems

Trends impacting the Dutch MedTech market

In the Netherlands, medical technology supports the treatment trend to move towards individual care that requires less surgery and focuses on prevention

Dutch healthcare trends		Description	Shift in patient category	
From	**To**		**From**	**To**
General healthcare	Individual healthcare	Healthcare is becoming more tailored to the specific needs of patients. Owing to advancements in technology, patients are receiving healthcare which better suits their needs. Technology is an important driver in making healthcare more closely tailored to the specific care needs of patients at an affordable price. The reimbursement system needs to deal with the increase in individual healthcare.	Primary, secondary and tertiary care	
Intramural	Home environment	Extramural care could be more cost efficient and less expensive than intramural care. Technology could be an important driver in increasing the extramural care component in the Dutch healthcare landscape.	Secondary and tertiary care	Long-term care
Therapy	Prevention	The goal of preventive care is to help people to stay healthy. Additionally, the idea of preventive care is to prevent diseases before they require hospital care. It also keeps people productive and enables them to be economically productive in their senior years. Large tech companies such as Apple and Google are expected to be enablers of this trend through e-health solutions.	Primary and secondary care	Prevention
Large equipment	Small equipment	Small diagnostic machines are increasingly substitutes for larger devices and include innovative features and software. Point-of-care testing is more commonly used by care providers. It enables care providers to do laboratory tests at the patient's bedside.	Secondary and tertiary care	
Invasive	Less invasive	In surgery, a gradual shift has been observed from invasive to less invasive procedures owing to advancements in medical instruments. Less invasive surgery could also lead to lower care costs as patients are expected to spend less time in hospital after a treatment/surgery.	Secondary and tertiary care	

Trends impacting the Dutch MedTech market

Together with Germany and the UK, the Netherlands is quick to adopt innovative surgical tools

Trends in major treatment areas

Category	Description	Implications
Autonomous surgical robots	Since the introduction of Intuitive Surgical's Da Vinci system, a number of robotic surgeries have been performed. However, medical device manufacturers are now developing autonomous surgical robots that no longer need to be controlled/assisted through human intervention. These robots will be used in complex, minimally invasive (MI) and soft tissue-related procedures to perform repetitive tasks or automate certain parts of a procedure such as steps needed during orthopaedic surgeries.	— Increase precision and enhance surgical outcomes — Minimise prolonged surgical time
3D printed surgical planning models and instruments	3D printed models will be used for planning complex surgeries including cardiovascular procedures to treat septal defects and replacement of heart valves, as well as neurological procedures. 3D printed surgical instruments are being developed with customised designs and shapes for surgeons to achieve better outcomes and minimise risks during surgeries.	— Enhance pre-operative planning — Improve surgical precision and success rate
Augmented reality assisted surgeries	Research is ongoing to use augmented reality to perform complex and minimally invasive surgeries. Augmented reality surgical navigation technology is being tested to perform spine and brain surgeries. The technology aims to enhance the success rate of image-guided surgeries offering x-ray imaging and optical imaging in an augmented reality view.	— Offer precise and real-time motion tracking — Improve the success rate of MI brain/spine surgeries

The surgical tools that are being deployed to assist in procedures in general, academic, and rehab hospitals have been designed and focused on microsurgery, surgery assistance, precision surgery, and minimally invasive surgeries, including examples such as the SOFIE surgical robot (from the Eindhoven University of Technology), the TELEflex advanced endoscope (University of Twente), and Intuitive Surgical's Da Vinci system, all of which were developed since the 2000s. More advanced recent examples in the use of augmented reality include Philips' deployment of its augmented reality surgical navigation technology for image-guided spine, cranial, and trauma surgery at Karolinska University Hospital (2017). Greater use of image-guided therapy will significantly impact the ORs of academic/tertiary centres as the multi-purpose nature of these procedures requires reconfigurations and better technical layout, integration, and interfaces.

Source: Philips is bringing augmented reality to surgery: Here's how, Medical device outsourcing; Why an Autonomous robot won't replace your surgeon anytime soon, Wired; RoboNED; KPMG analysis.

Trends impacting the Dutch MedTech market

Innovative start-ups work together with hospitals and large Dutch imaging companies to develop big-data-driven systems and diagnostic devices

Trends in major treatment areas			
Category		Description	Implications
	**Artificial intelligence systems**	Artificial intelligence (AI) systems are capable of crunching big data and identifying patterns that humans fail to interpret. MedTech companies are looking at AI solutions that will be used to make diagnoses and imaging of various conditions more accurate and predictive. More profound research and development is planned in the MedTech area for the diagnosis of cancer, cardiac disorders and neurological conditions.	— Faster, accurate diagnosis — Provide clinical decision support — Innovations in MedTech will increase precision, speed, personalisation, and automation of medicine, leading to better outcomes
	**Thread-based diagnostic device**	Scientists have developed a new type of surgical thread made from cotton or synthetics with the ability to collect diagnostic data and communicate it wirelessly in real time. These thread-based devices could potentially be used as smart bandages to monitor wound healing or smart sutures for surgical implants, or integrated with textile or fabric to be used as personalised health monitors and point-of-care diabetes tests.	— Develop low-cost implantable and wearable diagnostic tools

While AI technologies such as IBM Watson continue in their proof of concept in oncology (e.g. with Memorial Sloan-Kettering), many European providers have waited to see the outcome as the pioneer organisations prove the effectiveness of its automated image interpretation. However, AI appears to be more palatable and more immediately realisable based upon conversations with pharmaceutical providers who are deploying AI (e.g. Novartis, Sanofi's partnership with IBM Watson) in non-clinical decision support, such as in R&D improvement and clinical trials where it is used to identify matching opportunities.

Source: Medtronic, Samsung partner to develop neuromodulation implant apps for smart devices, FierceBiotech. Google DeepMind Wants to Save Eyesight with Artificial Intelligence, Medical Device\and Diagnostic Industry. KPMG analysis.

Trends impacting the Dutch MedTech market

Technology start-ups in the US and Europe are focusing increasingly on assistive care and therapy devices that reduce drug dependency

Trends in major treatment areas		
Category	**Description**	**Implications**
Leadless pacemakers	Leadless pacemakers have been developed for patients in need of permanent and single-chamber pacing therapy. These pacemakers do not require the use of wired leads to provide an electrical connection between the pulse-generating device and the heart. The less invasive and shorter implantation procedure for leadless pacemakers reduces recovery time and eliminates complications related to the transvenous leads.	— No visible surgical scar after incision of pacemaker — Reduce risk of infections
Neuroprosthetics	Neuroprosthetics are devices implanted in the patient's head that try to replicate the way brain cells communicate with one another. These devices can boost the capacity of the brain and improve recall functions in the future. Whenever an individual communicates, the brain fires a specific code that is unique to each person and is similar to a software command.	— Reduce dependency on drugs for neurological disorders
Ultrasound therapy	Research is being undertaken by scientists to develop non-invasive ultrasound therapy to treat patients with Alzheimer's. The ultrasound waves are able to cross the blood brain barrier, which is a layer that protects the brain against bacteria, to stimulate microglial cells. These cells clear the brain of neurotoxic amyloid plaques – structures that are responsible for memory loss and a decline in cognitive function in Alzheimer's patients.	— Reduce dependency on drugs for Alzheimer's patients

The use of ultrasound therapy has been led globally by UMC Utrecht – which has married the high-intensity focused ultrasound with MRI to create image-guided therapies. Its application has already been deployed in treating uterine fibroids, bone metastases, and breast cancer (since 2010). Future applications are being researched for liver, kidney, and pancreatic cancers. This approach will continue to be developed as the technology needs to be further proven, while in the Netherlands there is no comparative provider with these capabilities to-date.

Source: 'Intelligence is landlocked': Silicon Valley start-up wants to supercharge the brain with a computer chip, National Post. Ultrasound Therapy for Preventing Brain Aging and Alzheimer's, World Health. https://www.umcutrecht.nl/en/Research/Research-centers/UMC-Utrecht-Center-for-Image-Sciences/Research-programs/Image-guided therapeutic-ultrasound. KPMG analysis.

Trends impacting the Dutch MedTech market

Use of robotics in delicate surgical areas such as eye care is increasing in the Netherlands, which is in line with the global trend

Trends in major treatment areas		
Category	**Description**	**Implications**
Robotic eye surgery	Robotic eye surgeries will open up new avenues in eye operations which have been limited traditionally due to the physiological limits of the human hand. These technologies are likely to be used in ocular surgeries, such as vitreoretinal surgery – a highly delicate and precise operation.	— Higher degree of precision and control specifically for delicate operations
Miniature retinal scanners	Photonic integrated circuits could be used to reduce the size of optical coherence tomography (OCT) systems that are used for retinal imaging. The reduction in size could lead to benefits such as cost effectiveness, accessibility and instantaneous sharing of scans via smartphones.	— Enable self-diagnosis of retinal diseases — Enhance portability of OCT devices

The first development of robotic eye surgery technology in the Netherlands was announced in 2011 out of Eindhoven Technical University; it enabled better accuracy in sensitive procedures such as retina restoration or securing a detached retina. Engineers at the university subsequently formed Preceyes BV, a medical robotics firm that partnered with the University of Oxford in clinical trials to perform the first robotic eye surgery in 2016.

Source: The future of refractive surgery: Nonsurgical?, Eyeworld. New Refractive Corneal Collagen Cross Linking Procedure Approved in Europe, Shapiro Laser Eye Centre. Avedro Raises $32 Million for Commercialisation of Cross-linking Technology, Market Scope. Coin-sized retina scanner targets improved diagnosis, Modern Retina. http://www.ox.ac.uk/news/2016-09-12-world-first-robot-eye-operation. KPMG analysis.

Trends impacting the Dutch MedTech market

Patient-data-sharing technologies such as wearables and IoT enable seamless delivery of care in both remote and clinical/hospital settings

E-health trends		
Category	**Description**	**Implications**
Wearables	Wearable technology is being leveraged for various medical purposes. Going forward, it will be used to prevent the onset of, to diagnose, and to delay the progression of diseases. For instance, wearables could be able to detect cardiac arrhythmia or motor fluctuations in Parkinson's patients. They would also help to retain memories in patients with Alzheimer's and diagnose diseases such as diabetes and cystic fibrosis.	— Enable enhanced self-care practices — Provide preventive solutions
Internet of Things (IoT)	IoT technologies enable real-time monitoring and analysis of various medical devices and systems on a continuous basis, irrespective of whether the patient is in a hospital, at home or in a remote location. With this technology, patients and healthcare professionals have improved access to patient data and make better health decisions, thereby offering preventive healthcare solutions.	— Reduce cost of chronic medical care by lowering hospital readmissions
Cloud-based big data analytics	Cloud-based big data analytics are being leveraged to get insights from large volumes of data collected from laboratory tests, electronic medical records (EMR) and real-time monitoring of patient data in hospitals. Medical device companies are partnering with technology players to help enhance care delivery using big data analytics in clinical and remote settings.	— Improve patient outcomes — Reduce cost of healthcare

Philips' HealthSuite digital services, which include its platform and cloud-based infrastructure, aspire to enable the analysis, sharing, hosting, and connection of data between various healthcare providers, connected devices, apps, and patients. Widespread adoption of such a platform has not yet been observed, external stakeholders often ascribe this delay to challenges in data governance, privacy, and trust issues between the multiple stakeholders and siloed datasets between providers in the continuum. In the Netherlands at the time of writing, Radboud UMC is prototyping a solution for continuous monitoring of COPD patients via sensors, apps, and providers.

Source: How the IoT Is Enabling the Next Generation of Medical Devices, Medical design Briefs. 10 Medical-Device Wearables To Improve Patients' Lives, Information week Website. https://www.philips.nl/healthcare/innovatie/healthsuite-digital-platform/casestudies. KPMG analysis.

Trends impacting the Dutch MedTech market

Smart apps integrated with medical devices provide real-time access to patient data and support improved clinical decision-making

E-health trends			
Category		Description	Implications
	**Smart apps**	Medical device manufacturers are integrating smart apps with their devices. These smart apps are capable of tracking data not only from medical devices but from other information sources such as GPS and wearable activity trackers. They will provide patients and doctors with real-time insight into the impact on patients of particular diseases such as diabetes, cancer and neurological disorders.	— Enhance physician-patient engagement — Support improved clinical decision-making
	**Blockchain technology**	Blockchain technology works by storing blocks of unchangeable digitally recorded data. Each block is stored in a cryptographically hashed and linked linear chain. The potential use of the technology in healthcare is to integrate patient health data from wearables, sensors, mobile apps, medical devices and other IoT devices with no risk of cyber threats.	— Allow real-time access to patient data from anywhere — Improve diagnosis and care outcomes

While healthcare apps have been offered by pharma and medical device companies as complements to their products (for education or manual data input), more recent partnerships have connected technologies with providers, EPDs, and patients. Radboud UMC built one of the Netherlands' first connected digital health prototypes for diabetes patients in 2015, with an app and online community connected to EPDs, devices (e.g. wireless glucose meters, and activity monitors), and patient reported data. These models are being explored further across other chronic diseases – both in the broader connecting of devices, data, and stakeholders, but also in unlocking the value of data (e.g. from a clinical registry) and from a clinical decision-support perspective (e.g. development of algorithms).

Source: Medtronic, Samsung partner to develop neuromodulation implant apps for smart devices. Blockchain Healthcare start-ups, IntelligentHQ. KPMG analysis.

Trends impacting the Dutch MedTech market

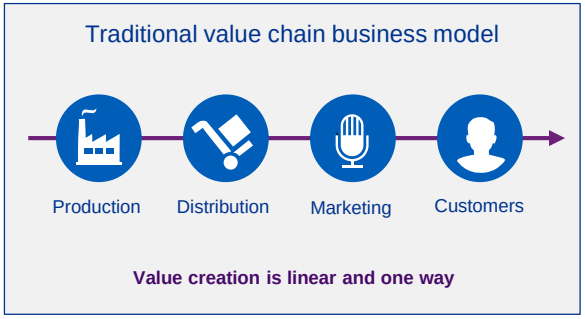
Large MedTech suppliers in the Netherlands are gradually moving towards customer-centric business and service models

Move from a traditional business model towards customer-centric models

Shift away from the traditional one-way business model

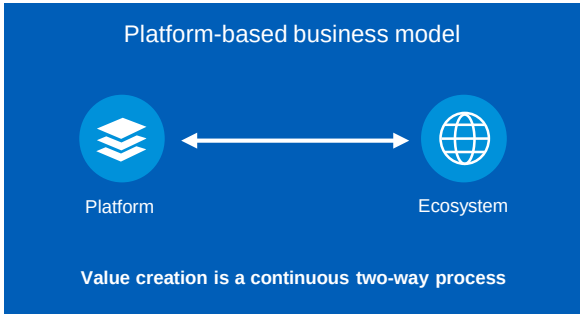
For MedTech companies, the blurring lines between the physical, digital and biological spheres require changes to their business model as decision-making power shifts away from manufacturers to other healthcare stakeholders.

In order to remain competitive when both the supply and demand sides of their businesses are being disrupted, device makers are gradually progressing from being product-centric to offering customer-centric, platform-based MedTech products and services.



Platform-based business model

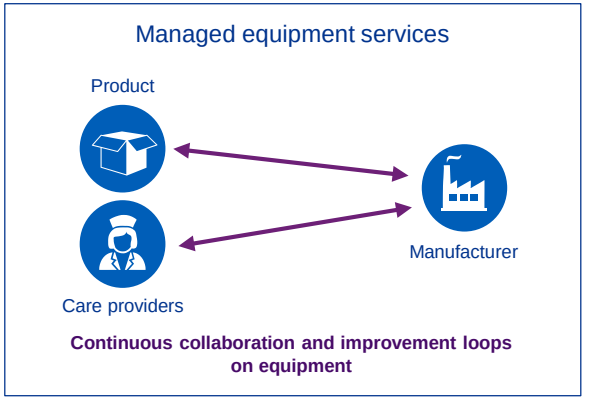
The platform-based business model approach is designed to support an entire ecosystem of interconnected patients, partners and providers. This will not only help in improving the quality and cost of patient care but will also provide new avenues for growth and represents an integrated approach that may lead to higher margins.



Managed equipment services

Managed equipment services mean that the hospital that purchases the equipment is provided with a service agreement under which all updates and improvements are installed on the equipment for a 15/20-year period.

This model stimulates collaboration between the hospital and suppliers through continuous innovation and feedback loops, and ensures that the hospital uses up-to-date technology for patients.



Source: Connected Care and Health Informatics, Philips Healthcare. Company website/annual report. KPMG analysis. Interview feedback.

Trends impacting the Dutch MedTech market

Customer- and patient-centric (value-based) business models already applied by large companies in the Dutch MedTech market

Examples of customer- and patient-centric models in the Dutch market

Platform-based business model – Philips Healthcare example

Philips Healthcare is looking to leverage a platform-based business model to gain market share and value across the continuum of healthcare needs.

The platform-based business model approach is designed to support an entire ecosystem of interconnected patients, partners and providers. This will not only help Philips in its aim to improve the quality and cost of patient care but will also provide the firm with new avenues for growth and represents an integrated approach that has the potential to lead to higher margins.

Managed equipment services – Siemens Healthcare example

Siemens Healthcare employs a business model in which it also offers products in managed equipment service arrangements. By working closely together with the healthcare provider, Siemens is able to improve its medical technology and implement changes directly with those institutions that have a managed equipment contract. These 'innovation labs' that Siemens employs also stimulate collaboration within certain specialist fields in hospitals.

Moving into healthcare – Medtronic example

Medtronic is another example of a company that is exploring new business models. With its integrated Health Solutions division, Medtronic supports hospitals to reduce the cost of care and improve quality and efficiency. But Medtronic has moved further into the delivery of healthcare, for example in 2015 by partnering with Diabeter, a clinic that focuses on the treatment of type-one diabetes. In the partnership, the client-friendly concept of Diabeter can be brought to a higher level, and to more patients in more countries. The collaboration accelerates the availability of new technologies to the patients and focuses on value-based healthcare (VBHC). Furthermore, Medtronic is playing a role in further advancing health-related IT and communications systems, broadening the access to and potential applications of remote control for patients, and thus making the healthcare it provides more patient-friendly.

Source: Wie doet het met wie – nieuwe allianties, KPMG, 2016.
https://diabeter.nl/en/about-diabeter/organisation/.
Connected Care and Health Informatics, Philips Healthcare.
Company website/annual report. KPMG analysis. Interview feedback.

Trends impacting the Dutch MedTech market

Traditional supply chain for MedTech is expected to be disrupted by VMI systems, IoT and direct sales by medical device manufacturers

Inventory management disruptions

Vendor-managed inventory (VMI) programmes

Medical device manufacturers are utilising VMI programmes in their manufacturing and supply chains to streamline operations and drive efficiencies.

The VMI programmes benefit medical device manufacturers through increased end-to-end supply chain visibility including track and trace, and management of the condition of devices. They also reduce on-hand inventory levels and generate cost savings.

To enhance the efficiency of VMI programmes/systems further, medical device manufacturers are collaborating with radio frequency identification (RFID) and smart sensor manufacturing firms.

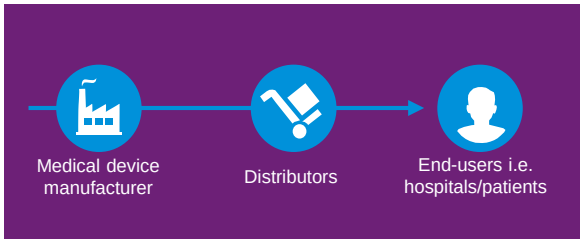
Internet of Things (IoT)

Industry players are leveraging the IoT to manage inventory which further adds to their operational efficiency.

IoT sensors embedded in parts/devices will help medical device manufacturers to achieve inventory stocking efficiency by implementing RFID and mobile scanners connected to the cloud.

Substituting the distributor's role

Medical device manufacturers are expected to eliminate distributors from the traditional supply chain. Distributors and other group purchasing organisations act as intermediaries between device manufacturers and users – they buy equipment in bulk and take discounts from manufacturers, selling on the products to hospitals.



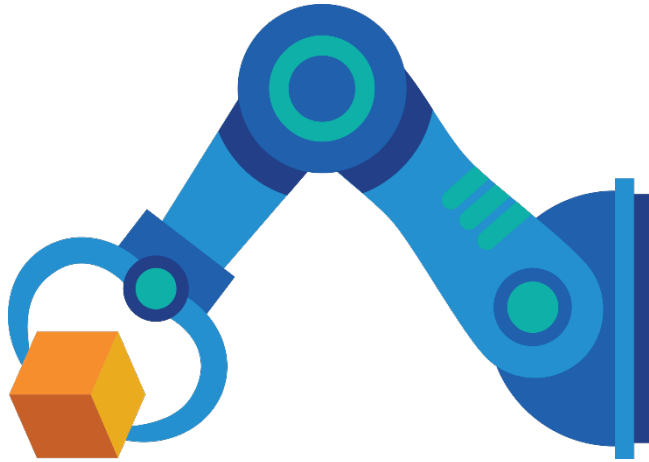
Taking on the role of a distributor, medical device manufacturers are selling their products directly to hospitals at discounted prices.

Small/medium-scale medical device companies, in particular, are expected to benefit from this transition as they will be able to sell products directly to hospitals.

Moreover, the marketplace is expected to be further disrupted, with speculation ongoing regarding e-commerce players such as Amazon entering the market to sell medical devices online.

Source: Medical Product Outsourcing; Transforming The European Medical Device Supply Chain: Adding Value And Reducing Costs, DHL Supply Chain, How Johnson & Johnson's Supply Chain Made Strides in 2016, Johnson & Johnson. 'How Amazon is Poised to Disrupt the MedTech Industry', MDDI Online.
KPMG analysis.

Levers of MedTech adoption



Regulatory enablement

Regulation or policy within a country regarding speed and access to medical technology

Incentives to make it happen

Financial incentives that explicitly incentivise use of technology to enable better care to be delivered more affordably

Necessity as the enabler of innovation

Necessity to adopt, aligned along the triple aim of improving experience/ access, health outcomes, and cost

Levers of the MedTech adoption

The external environment is an important factor in the wider adoption of MedTech (2)

Role of the external environment

As described on the previous pages, there are multiple examples, including in the Netherlands, of care providers adopting new medical technology in providing healthcare and treating patients. The degree of adoption largely depends on the drive and enthusiasm of the healthcare professionals and the leadership of the care providers. Moreover, having a focus on technology or on creating partnerships with technology providers stimulates innovation and broad adoption.

In order to achieve national adoption of medical technology, the external environment plays a pivotal role, especially when medical technology transforms the way healthcare is delivered.

Our analysis of multiple international examples revealed three key levers in the external environment that influence the degree of adoption of medical technology within a given country:

1. *Regulation or policy* within a country regarding speed and access to medical technology;
2. *Financial incentives* that explicitly incentivise the use of technology and enable better care to be delivered more affordably;
3. *Necessity to adopt,* aligned along the 'Triple Aim', i.e. improving experience/ access, health outcomes, and cost(2).

The next pages discuss these three external levers, with some illustrative international examples.

Regulation and policy

Approvals and Fast-tracking Access – FDA (US)

The FDA's policies have provided an accommodating environment to allow access for medical devices. Much of this mandate was provided by the 21st Century Cures Act. This Act created the Breakthrough Devices categorisation which seeks to approve or deny requests within 60 days, considering other data sources for approval. Furthermore, it eased definitions of certain things like Digital Health apps, allowing them to be excluded from the device definition, for example those which passively collect information. The Act also defined a classification system which assesses the level of effort in obtaining approval depending on the risk of causing injury or death to a patient, Class 1 being low risk (*e.g.* floss) versus Class 3 being devices that can potentially injure or kill a patient (*e.g.* pacemaker).

Regulation and policy can reduce barriers to access, affect speed to market, and can promote adoption of technologies in care delivery. Regulation can affect both the actual access to technology and the speed of access. For example, if there is a one-size-fits-all approach for granting access to all the different types of medical technology, this may delay the access to technologies that would otherwise need a less strict approval protocol, such as digital health apps. The speed of the US food and drug administration (FDA) approval process is relatively slow compared to the EU because the FDA requires greater evidence before permitting access. The FDA is currently deploying different avenues for the approval of different types of medical technologies, speeding up the process of approval and access to the market.

In addition, health technology assessment (HTA) bodies have a certain degree of influence on advising or deciding about the reimbursement of new medical technology. If medical technology is being reimbursed this increases the adoption of the technology. Sweden for example has a national HTA that has a large degree of influence on the ultimate reimbursement, whereas Denmark has regional HTAs that make local decisions, and there is no regulatory requirement to use a HTA in policy decision-making and planning. This gives healthcare providers in Denmark more freedom to disregard the recommendations] of the HTA, making sure that patients receive access to the technologies they need.

Levers of the MedTech adoption

The external environment is an important factor in the wider adoption of MedTech (2)

In addition to regulation, national policy could also create a policy imperative for the use of new technology in the delivery of healthcare. For example, the 'Five Year Forward View' of the NHS states that the UK healthcare system needs to leverage the potential of technology and innovation, enabling patients to take a more active role in their own health and care while also enabling NHS staff and their care colleagues to do their jobs (see box below).

NHS Five Year Forward View (UK)

The UK NHS' Five Year Forward View invests in a five-year plan with a focus on improving the deployment and adoption of technology and innovation in care delivery, including creating test bed sites, partnering life sciences with NHS providers, and investing in models such as the NHS' own incubator for innovation and the launch of a library of NHS apps. It has also created the NHS Innovation and Technology Payment: "creating the conditions and cultural change necessary for proven innovations to be adopted faster and more systematically through the NHS, and to deliver examples into practice for demonstrable patient and population benefit." It will do this by identifying innovations where financial or procurement barriers are preventing widespread adoption in the NHS despite good evidence that prevalent adoption would deliver efficiency and improve quality in healthcare.

Source: https://www.statnews.com/2016/06/28/medical-devices-safety-europe-us/. IHI. FDA, 2017, retrieved from: https://www.fda.gov/RegulatoryInformation/LawsEnforcedbyFDA/SignificantAmendmentstotheFDCAct/21stCenturyCuresAct/default.htm. Health Technology Assessment in the European Union – State of Art and Future Scenarios, Icom Innovation, February 2017. Next steps on the NHS Five Year Forward View, NHS, March 2017.

Levers of the MedTech adoption

Flexibility within funding or dedicated funding increase the adoption of MedTech

Financial incentives to adopt new technology

The way healthcare and medical technology is funded can greatly influence the adoption of medical technology in the delivery of care. The adoption of medical technology can be increased by flexibility in funding healthcare including a possible return-on-investment, and by explicit incentives to use medical technology.

If there is more flexibility in the use of funds, it is easier to get a return on investment from new technologies. In Israel, for example, funding based on the health of specific segments of the population allows the healthcare provider Clalit to allocate funding into its infrastructure (see box on the right). In the US, New York State's 'Delivery System Reform Incentive Payment' (DSRIP) programme, bundled payments enable technology investment for things that normally would not be reimbursed, but can improve patient outcomes, like air conditioners to reduce exacerbations for asthma patients. The South African health insurer Discovery Health was also encouraged by a possible return-on-investment to invest in wearables and digital platforms to improve care outcomes (see box on the right).

Source: (1) https://www.opengovasia.com/articles/7649-ds-supporting-3-bs-objectives-and-principles-of-singapores-health-it-master-plan,retrieved on 1/12/2017.
https://www.nza.nl/publicaties/nieuws/129745/, retrieved on 9/12/2017.

Other ways to stimulate the adoption of medical technology are to provide funds to purchase new technology (e.g. subsidies, grants, etc.), or to arrange reimbursement for the use of medical technology. Singapore, for example, has been investing in and providing funding for the implementation of technology since 2014 in accordance with its Health IT Master Plan. In the Netherlands, teleconsultations with dermatologists by GPs have been reimbursed since 2007, enabling the use of this technology in the diagnosis of dermatological diseases, and therefore reducing the number of referrals to hospitals.

Recognising the Return on Investments (ROI) in Devices – Discovery Health (South Africa)

Discovery Health's Vitality programme supports its health insurance product by providing incentives to its members to live a healthier, more active lifestyle. Discovery Vitality was launched in South Africa in 1997 and is designed around evidence-based interventions and behavioural economics to improve health outcomes. The programme encourages customers to track essential health indicators (through FitBit data) and set goals for improved health, then earn points by making progress such as completing assessments, exercising, purchasing healthy food, quitting smoking, and losing weight. As customers earn points, they can redeem various rewards, including cash back and discounts at retailers.

The programme encourages healthy behaviour, improves health outcomes and, by extension, reduces medical costs associated with health plans over the long term. The company's significant investment in the Vitality programme and brand has led to higher new business levels, strong performance in terms of loss ratio and lapse rate and product innovation opportunities that create further competitive advantage.

Incentive Structures Enabling Clalit to Invest (Israel)

The reimbursement and investment structure in Israel has given both Israel and Clalit flexibility without the specificity of how they allocate their funding, and enabled them to invest in technology to find low-cost primary-based solutions. As a result, low-cost primary care access has created a system which is highly MedTech-focused, including the fact that over 60% of pediatric consultations in Israel happen over smartphones.

Technology has allowed Clalit to enable lower cost types of care such as self-management, primary-based preventative care, and the lower-cost delivery through e-consults.

National investments in technology (Singapore)

Singapore provides national investments in everything from the rollout of video consultations, to partnerships with its National Robotics Programme to use more robotics in care delivery, such as 'smart wards' that will be integrated with smart logistics in hospitals. This is in line with the shift of care from hospitals to the community through for example robotics-assisted home care. Data can enable the identification of cost-effective clinical practices, reducing costs, without any drop in clinical outcomes.

In addition to looking for opportunities for such value-driven care, the Ministry of Health in Singapore is exploring predictive analytics. A group of government-supported researchers has developed a predictive model for identifying discharged patients who are at risk of multiple readmissions; it enables proactive early intervention to be provided to better support these patients. A 'Hospital to Home' programme supported by this model is expected to serve some 19,000 patients in 2017(1).

Levers of the MedTech adoption

An increasing necessity in the Netherlands might require more adoption of MedTech (1)

Necessity as a key lever for adoption

The last external key lever for broad adoption of medical technology is necessity, where health technology is leveraged and integrated into care delivery models to achieve the triple aim: improving access, quality, and costs of care. If a country has a need to improve either of these aims, and medical technology can provide a solution, the adoption of that technology is more likely to happen.

The boxes on the right show several examples of medical technology improving access, quality and costs of care.

The environment for MedTech in the Netherlands

In the Netherlands, quality and access are coming under pressure while at the same time healthcare spending is increasing due to the aging population and the increasing number of people with (sometimes multiple) chronic diseases. These demographic developments are creating the need for a focus on limiting healthcare costs, without reducing access and quality. This could transform the Netherlands into a highly MedTech-adopting country, by leveraging the external levers as discussed on the previous pages.

In conclusion, the three factors that enable nationwide adoption are:

1. Regulatory enablement. Regulations in health technology need to exist to protect patients from unsafe devices but can also prevent access to technologies that could save their lives. Regulation needs to be nimble enough to provide access to patients for technology, but needs to have the authority to ensure that technologies help and not harm patients.
2. Incentives make it happen. Providers will typically behave the way in which they are funded – and their adoption of medical technology is impacted by this. The use of explicit levers to enable technology (e.g. subsidies), or more flexible payment models which incentivise outcomes over individually paid treatments can enable better use of technology.
3. Necessity as the enabler of innovation. Medical technology has risen to the challenge of helping healthcare providers to achieve the ‘triple aim’ of improving cost, quality, and access. Innovation does not need to reinvent the way care is delivered, but can augment the situation between patients and providers to improve access to care, intervene in a more timely way, and do it more affordably.

Improving care (Geographic) access with technology – Ontario Telemedicine Network (OTN) (Canada)

The Ontario Telemedicine Network is one of the largest telemedicine networks in the world and plays a key role in providing access to care in particular in areas such as rural Ontario, where patients can be significant distances from providers/have reduced access. OTN delivers video consults, provides tele home care, and promotes the use of telemedicine. OTN has curated and established various solutions and programmes that Ontario’s healthcare providers and organisations can take advantage of to deliver patient-centred healthcare that is focused on the home environment, and improve their practice and administrative functions.

Source: OTN.

Levers of the MedTech adoption

An increasing necessity in the Netherlands might require more adoption of MedTech (2)

Hub and spoken technology models for care quality, access, and cost savings – Mercy Virtual (US)

Mercy Virtual is a hospital without a bed. The medical team can, with the help of technology such as highly sensitive cameras and real-time vital signs, 'see' patients where they are and diagnose patients and deliver care remotely. It supports Mercy's network of hospitals, primarily through the virtual dashboards that they use to monitor patients. So far, Mercy Virtual has been able to generate savings through improving care delivery, reducing waste of supplies, and reducing intensive care bed days and travel costs to visit patients. "For example, Mercy Virtual has helped its parent health system save $9.2 million annually by using technology from the software company SAP to standardise communication and terminology throughout its facilities and reduce waste of very expensive surgical supplies. Remote patient monitoring by Mercy Virtual has also helped reduce total intensive care patient days in the hospital by 90,000 over a period of a several years, which translated into savings of $50 million.(2) "

Low-resource settings leveraging technology – m-Health (developing world)

There is a significantly higher uptake of mobile health, known as mHealth in the developing world than in developed countries. An EIU(1) analysis shows an uptake of approximately 59% of emerging market consumers using an mHealth app compared to 35% in the developed world. There are various 'necessity' reasons why the developing world is scoring higher in terms of adoption compared to the developed world. This includes everything from providing access which is difficult geographically and/or from the supply-side perspective of providers (e.g. hospitals might be long distances from the villages they serve, or there could be a shortage of specialists in these regional care settings), to improving the cost of delivery and the quality of care. For example, in many of the developing countries such as India, the vast majority of care is paid for out of pocket by patients, and therefore mHealth is the only way to make care affordable. From a quality perspective, mHealth can be used to improve outcomes for patients by providing them with more information to self-manage, potentially intervening earlier, or helping them by supporting decision-making.

Source: (1) EIU, from: https://www.pwc.in/press-releases/global-mhealth-adoption.htm.
(2) Mercy Virtual.
OTN.

KPMG

Appendix

Glossary

AI	Artificial intelligence
AWBZ	Dutch law on special healthcare
CBS	Central Bureau voor de Statistiek (statistics)
COPD	Chronic obstructive pulmonary disease
CPAP	Continuous positive airway pressure
DSRIP	Delivery System Reform Incentive Payment
EHCI	European Health Consumer Index
EPD	Dutch healthcare system – electronic patient records
ENT	Ear, nose and throat
Extramural care	Care outside the hospital
FDA	Food and Drug Administration
GGD	Dutch municipal or common health service
GGZ	Mental healthcare
GP	General practitioner
HTA	Health technology assessment
ICT	Information and communications technology
Intramural care	Hospital care
IoT	Internet of Things
IT	Information technology
IVD	In vitro diagnostics
IVDR	In vitro diagnostics EU regulation
MDR	Medical devices EU regulation
MedTech	Medical technology
MI	Minimally invasive
OCT	Optical coherence tomography
RFID	Radio frequency identification
ROI	Return on Investment
SMEs	Small and medium enterprises (<250 FTEs)
TFHC	Task force healthcare
VBHC	Value-based healthcare
VMI	Vendor-managed inventory
VVT	Dutch nursing homes and home care industry
VWS	Dutch Ministry of Health, Welfare and Sports
WLZ	Dutch law on long-term care
WMO	Dutch law on social support – Municipality-financed healthcare
ZVW	Dutch basic health insurance

Appendix

Matrix

Market size estimate - Medical technology in the Netherlands																		
€Bn	1. Preventive care/ self care	2. General practitioner	3. Dentist	4. Pharmacy/medical specialty sto	5. Optician	6. Audiologist	7. Gynaecology	8. Paramedical care	9. Independent treatment center (Z	10. Mental healthcare (GGZ)	11. Rehabilitation care	12. General hospital	13. Top clinical hospital	14. Academic hospital	15. VVT Intramural	16. VVT Extramural	17. Other	Total
17. Care products (incl. stoma & wound management)																		0.58
18. Diagnostics and imaging (incl. patient monitoring)																		0.50
19. Ophthalmic (incl. implant, prostheses and glasses))																		0.44
20. Cardiology (incl. prostheses and implants)																		0.37
21. Orthopedics (incl. proheses & orthopedic shoes)																		0.34
22. in Vitro Diagnostics																		0.34
23. General hospital & Plastic surgery																		0.29
24. Medical aids (Incl. communication, signaling, food delivery, mobility, and arm-hand-finger function)																		0.27
25. Dental																		0.27
26. Ear, Nose, & Throat (incl. hearing aids)																		0.24
27. Drug delivery (incl. dialysis)																		0.19
28. Diabetic care (incl. implants and prostheses)																		0.13
29. Respiratory Equipment																		0.12
30. Home adaptation																		0.12
31. E-Health home automation/ Robotics																		0.11
32. Neurology																		0.06
33. Endoscopy																		0.06
34. Contraception (birth control)																		0.00
35. Other																		0.22
Total	**0.06**	**0.07**	**0.29**	**0.53**	**0.43**	**0.22**	**0.01**	**0.19**	**0.09**	**0.03**	**0.26**	**0.95**	**0.72**	**0.47**	**0.23**	**0.16**	**-**	**4.7**

Appendix

Matrix – Sources

1	Interview feedback (e-health preventive care + 30% of other category).
2	CBS (Total costs for GP * client & bewonersgebonden kosten * MedTech % in P&B gebonden kosten), verified by interview feedback, verified by KPMG expert on percentage of care products, diagnostics and imaging, in vitro diagnostics, drug delivery).
3	Based on KPMG research into dental lab spend, verified in interview feedback (medical equipment spend as % of total spend for dentists, extrapolated).
4	Farmaceutischcompas, assumption MedTech part based on interview feedback, verified by KPMG expert on percentage of other, diabetic, drug delivery, respiratory, orthopaedics, care products).
5	Based on revenue * COGS of total opthalmics market (based on 2 largest opticians) + specialty glasses from GIP Peilingen * assumption for MedTech part * assumption for part insured by ZVW.
6	Based on GIP Peilingen * assumption for MedTech part * assumption for part insured by ZVW, verified by interview feedback.
7	Based on GIP Peilingen * assumption for MedTech part * assumption for part insured by ZVW, verified by zorgcijferdatabank (Total costs * Patient & bewonersgebonden kosten * MedTech % in P&B gebonden kosten).
8	Based on GIP Peilingen * assumption for MedTech part * assumption for part insured by ZVW for orthopaedics (*50%), medical aids (*5%) & home adaptation (*60%), % based on KPMG expert, total verified by interview feedback.
9	Based on NVZ ziekenhuizen, share ZBC * general and academic total spend, verified by care products (15%) + in vitro (50% of extramural in vitro).
10	Based on medical aids, home altering equipment, verified by CBS, client en bewonersgebonden kosten* % MedTech, verified by interview feedback.
11	Based in on parts of care products, orthopaedics, medical aids, drug delivery, based on KPMG expert, interview feedback on orthopaedics.
12	Based on interview feedback, % of revenue spend on MedTech, extrapolated (disposables & capital equipment) (11%).
13	Based on interview feedback, % of revenue spend on MedTech, extrapolated (disposables & capital equipment) (9%).
14	Based on interview feedback, % of revenue spend on MedTech, extrapolated (disposables & capital equipment) (6%).
15	VVT extramural, based on % in 'De verpleeg- en verzorgingshuiszorg en thuiszorg in kaart' --> total based on interview CBS (Total costs * Patient & bewonersgebonden kosten * MedTech % in P&B gebonden kosten), verified by interview feedback, verified by KPMG expert on percentage drug delivery, respiratory equipment, home adaptation, e-health, care products, medical aids)'
16	VVT intramural, based on % in 'De verpleeg- en verzorgingshuiszorg en thuiszorg in kaart' --> total based on interview CBS (Total costs * Patient & bewonersgebonden kosten * MedTech % in P&B gebonden kosten), verified by interview feedback, verified by KPMG expert on percentage drug delivery, respiratory equipment, home adaptation, e-health, care products, medical aids).
17	Based on GIP Peilingen * assumption for MedTech part * assumption for part insured by ZVW and GlobalData Medical Equipment – wound care, verified by wound product % interview feedback (hospitals).
18	Based on ING Sectorstudy (extrapolated), verified by interview feedback, verified by extrapolation of intramural imaging costs, challenged by OECD data.
19	Based on revenue * COGS of total opthalmics market (based on 2 largest opticians) + specialty glasses from GIP Peilingen * assumption for MedTech part * assumption for part insured by ZVW.
20	Based on GlobalData Medical Equipment, verified by interview feedback
21	Based on GlobalData Medical Equipment + GIP Peilingen * assumption for MedTech part * assumption for part insured by ZVW, verified by interview feedback.
22	Based on interview feedback, verified by sensecheck from EvaluateMedTech and GlobalData.
23	Based on GlobalData Medical Equipment.
24	Based on GIP Peilingen * assumption for MedTech part * assumption for part insured by ZVW, verified by interview feedback (WMO).
25	Based on KPMG research into dental lab spend, verified in interview feedback (medical equipment spend as % of total spend for dentists, extrapolated).
26	Based on GIP Peilingen * assumption for MedTech part * assumption for part insured by ZVW, verified by interview feedback.
27	Based on GlobalData Medical Equipment + GIP Peilingen * assumption for MedTech part * assumption for part insured by ZVW.
28	Based on GIP Peilingen * assumption for MedTech part * assumption for part insured by ZVW, verified by interview feedback.
29	Based on GIP Peilingen * assumption for MedTech part * assumption for part insured by ZVW.
30	Based on GIP Peilingen * assumption for MedTech part * assumption for part insured by ZVW, verified by interview feedback.
31	E-health monitor, interview feedback.
32	Based on GlobalData Medical Equipment.
33	Based on 'Endoscopy market trends' * Dutch part of world market, verified by % endoscopy spend of total hospital revenue.
34	Based on GIP Peilingen * assumption for MedTech part * assumption for part insured by ZVW.
35	Based on other ratio of other research. We assumed approximately 5% of total in other category.

KPMG

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