The Medical Technology Group

Improving patient access to medical technology

KEEPING BRITAIN WORKING

How medical technology can help reduce the cost of ill health to the UK economy

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Introduction

The NHS is under pressure to do more with less money. The demand for services continues to outstrip the increases in funding. The service is struggling to meet the £22bn savings target.[1] The challenge is enormous and it will require the NHS to change the way care is delivered and patients are managed. Medical technology can help the NHS to achieve this. Giving patients access to the most appropriate technology and ensuring that they receive the best possible treatment first time can help deliver system wide efficiencies.

The Five Year Forward View sets out how the Government will approach the savings challenge. The 44 Sustainability and Transformation Partnerships are beginning to make changes to the way that local services are delivered.

The potential for technology to deliver improved healthcare outcomes and make long term savings is not yet central to Government and NHS plans to deliver real change. Often technology and the treatments that depend on technological inputs are viewed as a cost driver. There is evidence that commissioners are seeking to limit patient access to deliver savings. This often takes the form of arbitrary limits to patient access using BMI and smoking as a barrier to treatment.[2]

The challenge for healthcare providers and the NHS is that the full cost of medical devices often comes in year one. Whilst many pharmaceutical treatments may have low upfront costs, but come with a requirement for long term investment, as patients will need treatments for many years, medical devices often require a larger initial amount of funding but will not require continual investment. This results in the savings from medical devices only being realised after a number of years.

Outside of the direct costs to the healthcare system there are further benefits associated with patient access to medical technology. For many patients their device allows them to get back into work and lead a

1 https://www.kingsfund.org.uk/sites/files/kf/field/field_publication_file/Deficits_in_the_NHS_Kings_Fund_July_2016_1.pdf
2 http://www.abhi.org.uk/media/1379/hip-and-knee-replacement-the-hidden-barriers.pdf

full and active life. Technology can give people back their independence and allow them to continue making a full economic contribution.

Technologies can also help patients maintain control over their condition and allow them to avoid the need for emergency treatment and unplanned trips to hospital. Unplanned admissions are a huge cost for the NHS. By giving patients the tools they need to treat themselves the NHS can make savings by avoiding emergency care.

There are also the benefits that are realised amongst family members and carers of those living with physical problems. The burden of care for the sick often falls on close family members, often limiting their ability to work. Giving patients back their independence also allows their family members to lead a full and active life.

In 2011 The Work Foundation published a report entitled 'Adding Value: The Economic and Societal Benefits of Medical Technology', sponsored by the Medical Technology Group (MTG). This report looked at the wider societal benefits of giving patients access to medical technology and outlined the savings that could be made. The report found that medical technology delivered savings in hip replacements, insulin pumps and implantable cardiac defibrillators.

In just three technologies there is the potential to save the UK economy around £90m per year.

In this report the MTG has conducted their own study, looking at eight areas and the savings that are currently being generated or the savings that could be available through improved patient access.

The technologies:

- **Hip replacements**
  Hip replacement is one of the most commonly performed operations on the NHS. Over 100,000 patients undergo a hip replacement every year. Many of these patients are still of working age and are able to return to work following their operation. The MTG found that 18,500 people are currently in work thanks to a hip replacement, saving the UK Government £70m.

- **Implantable Cardiac Defibrillators (ICDs)**
  ICDs support people with abnormal heart rhythms to live and work. The MTG found that the UK Government currently saves £3m per year through patients returning to work with an ICD. If the UK got the number of people with an ICD up to the European average they would save a total of £4.3m.

- **Insulin Pumps**
  Insulin Pumps allow people with diabetes to manage their condition more effectively and give them the freedom to work and lead active lives. Poor blood glucose management is seen as a key factor in the cost of diabetes. The MTG found that insulin pumps save the UK Government £13.8m every year.

- **Diagnostics**
  Giving patients access to rapid diagnostics allows clinicians to set patients on the right pathway at the start of their care, avoiding mismanagement and a worsening of their condition. We looked at sepsis and found data that shows that if patients were given access to rapid diagnosis there could be savings of £160m.

- **Women's health**
  Large numbers of women suffer from fibroids and many will not need medical help. For those that do they can end up undergoing a hysterectomy. Fibroid embolisation is less invasive and less traumatic for women. We found that £76m savings could be delivered through giving more patients access to embolisation.

- **Pain management**
  Chronic pain is a common condition in the UK. Up to 55% of people could be living with it. For many patients treatment options are limited. Around 1% of patients could benefit from a Spinal Cord Stimulator, this would see 1,000 people returned to work and save the Government £3.8m.

- **Wound care**
  Chronic wounds effect hundreds of thousands of people in the UK. Better management of wounds can help patients and deliver £25.3m of savings.

- **Percutaneous Coronary Interventions (PCI)**
  Coronary heart disease costs the UK nearly £2bn per year. PCI can open up blocked arteries and help patients lead a normal life. PCI currently saves the UK around £123.3m per year.

Key findings:

Clinical area	Technology	Savings	Patients impact
Orthopaedics	Hip replacements	£70m	18,500 people returned to work
ICD	Use of ICDs	£4.3m	1,150 people returned to work
Insulin pumps	Getting 12% of people with diabetes on insulin pumps	£13.8m	60,000 receiving better treatment
Diagnostic: Sepsis	Use of rapid diagnosis for patients with suspected sepsis	£160m	11,000 lives saved
Women's health: Uterine Fibroid Embolisation (UFE)	Use of fibroid embolisation	£76m	
Pain management	Use of spinal cord stimulation to help manage pain	£3.8m	1,000 patients back in work
Wound care	Use of compression bandages	£25.3m	108,600 receiving improved treatment
PCI	Use of PCI to treat to treat patients with narrowed or blocked arteries that supply the heart muscle with blood	£123.3m	32,456 patients returned to work
TOTAL		**£476.5m**	**232,706 patients helped**

Call to Action

In order to support improved uptake and use of medical technology, the MTG has developed the following Call to Action that sets out how patient access could be improved:

Consider all the evidence

- Acknowledge the wider societal benefits of medical technologies
- Value return to work and independent living as health outcomes
- Invest in medical technologies to improve quality of care

Communicate the benefits

- Increase patient awareness and choice
- Use the expertise of patient support groups to share knowledge
- Improve alignment of clinical practice with the benefits of technologies recommended by NICE and other guidance

Seize the opportunities

- Include formal reviews of technology uptake in national standards and guidance
- Reward long-term decision making to improve health outcomes
- Instill long-term incentives to secure recommended uptake

What is a medical device?

Medical technologies come in the broad categories of devices, diagnostics, and information gathering and processing tools. They include surgical interventions that can be implanted into the body such as orthopaedic hip and knees, pacemakers and stents, technologies that support clinicians in their everyday work such as syringes, surgical tools and diagnostic scanners and devices that help people maintain active lives such as insulin pumps, colostomy bags, and wheel chairs.

Medical devices are present at every stage of the healthcare process, from the moment you see your GP and they use a stethoscope to check your heart beat, to diagnosis using a scanner or IVD system, undergoing a surgical procedure and receiving an implant, and finally using assistive technology to support your recuperation.

The cost of ill health

- The economic costs of sickness absence and worklessness associated with working age ill-health are over £100 billion a year.[3]
- Sickness absence to UK tax payers and employers has a direct cost of £22bn per annum.[4]
- Individuals collectively miss out on £4 billion a year of lost earnings.[5]
- Over 300,000 people each year take up health-related benefits.[6]
- Almost a million workers take more than a month off each year.[7]

3 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209782/hwwb-working-for-a-healthier-tomorrow.pdf
4 https://www.england.nhs.uk/wp-content/uploads/2014/10/5yfv-web.pdf
5 Ibid
6 Ibid
7 https://www.gov.uk/government/news/a-million-workers-off-sick-for-more-than-a-month

Chapter 1: Orthopaedic Implants

Over 100,000 people underwent a Total Hip Replacement (THR) in 2016.[8] This is one of the most common and effective procedures carried out by the NHS. For patients the impact of a THR is life changing, patients are given back their mobility and often they are able to return to work and lead a full and active life.

The scale of the problem

Musculoskeletal conditions are some of the most prevalent conditions in the UK, with over 10 million people suffering from one.[9] Estimates suggest that by 2030 the UK working population will include 7 million people with a musculoskeletal condition.[10] In 2013, back pain, neck pain, upper limb problems and other musculoskeletal problems together accounted for the greatest number of working days lost in the UK at 30.6 million days.[11]

The procedure:

The hip is a ball and socket type joint which allows for a wide range of movement. Arthritis can damage the cartilage covered areas of the joint and lead to reduced movement and friction. This can lead to damage to the joint which will ultimately require a hip replacement or resurfacing operation.

In a hip replacement or resurfacing operation, the surgeon replaces the damaged parts of the joint with artificial parts that may be made of plastic, ceramic, or metal.

8 http://www.njrreports.org.uk/hips-all-procedures-activity/H01v2NJR?reportid=C6F582E2-140D-4D22-8C4E2C354EDB1B41&defaults=DC__Reporting_Period__Date_Range=%22MAX%22,JYS__Filter__Calendar_Year__From__To=%22max-max%22,H__Filter__Joint=%22Hip%22
9 http://www.arthritisresearchuk.org/policy-and-public-affairs/reports-and-resources/reports/work-report.aspx
10 Ibid
11 Ibid

Patient numbers:

- **101,651 replacement procedures in 2016**
- **Average age of female receiving a hip was 69.8, for males it was 67.6**
- **90% of replacements were a result of osteoarthritis**
- **Average BMI was 28.8 – which is overweight but not classified as obese[15]**

Rheumatoid arthritis has been estimated to cost the UK economy between £3.8–4.8 billion per year, the combined costs of rheumatoid arthritis and osteoarthritis £14.8 billion and a further £10 billion of indirect costs are attributable to back pain.[12]

For patients, the impact of these conditions often leaves them unable to work and make a full contribution - 40% of people with musculoskeletal diseases of working age are not in work. The total cost of osteoarthritis to the UK economy is estimated at 1 per cent of GNP per year.[13]

20% of female and 25% of male patients receiving a hip replacement are under the age of 60. 19% of women and 18% of men undergoing a total knee replacement are under the age of 60.[14]

Patient outcomes

There is evidence to support the impact of THR on patients' lives. Almost all patients, 96% of patients, receiving a total hip replacement said their condition had improved.[16] 9 out of 10 patients described the outcome of their hip procedure as good or excellent.[17]

Economic analysis has shown that 85% of hip operations have a cost per quality-adjusted life year (QALY) of less than £20,000 (with 70% having a cost per QALY under £10,000) compared to no surgery. Studies have concluded that 'these results help to confirm the long-term benefits and cost-effectiveness of total hip replacement in a wide variety of patients using well-established implant models such as the Exeter.'[18] A separate study from 2013 concluded that 'this study provides up-to-date cost-effectiveness data for total joint replacement. THR and Total Knee Replacement (TKR) are extremely effective both clinically and in terms of cost effectiveness, with costs that compare favourably to those of other medical interventions.'[19] A third study concluded that 'Hip and knee replacement both improve Health Related Quality of Life'.[20]

Employment and the savings to society

The 'Adding Value: The Economic and Societal, Benefits of Medical Technology' published in 2011 stated that *'in general, the review found evidence that more than 60 per cent of those people already working prior to their THR or TKR procedures had subsequently*

12 Ibid
13 https://www.nice.org.uk/guidance/cg59/documents/osteoarthritis-full-version-draft-guidance-for-consultation2
14 http://www.mtg.org.uk/wp-content/uploads/2017/01/Adding-Value-The-Economic-and-Societal-Benefits-of-Medical-Technology.pdf
15 http://www.njrreports.org.uk/Portals/0/PDFdownloads/NJR%2014th%20Annual%20Report%202017.pdf
16 http://www.hscic.gov.uk/catalogue/PUB17876/final-proms-eng-apr13-mar14-fin-report-v1.pdf
17 Ibid
18 http://bmjopen.bmj.com/content/2/3/e000752
19 https://www.ncbi.nlm.nih.gov/pubmed/23307684
20 https://www.ncbi.nlm.nih.gov/pubmed/8870116

returned to work (Mobasheri, Gidwani and Rossan, 2006). These findings are supported by research conducted by Lyall, Ireland and El- Zebdeh (2009). The time elapsed prior to returning to work also varies significantly between studies. Studies have reported times ranging from a little over a week (Espehaug et al., 1998) to several months (Mobasheri et al., 2006).'[21]

The report concluded that '*Evidence indicates that 30.4 percent of hip replacement patients of working age are able to work. At least 60 per cent of those working before the hip replacement procedure return to work after the surgery without the need to claim Employment and Support Allowance of just under £3,400 per person per year (at 2011 prices). That means that just in 2009 about 11,000 people in England and Wales were enabled to return to work, saving the UK economy £37.4 million per year of their working lives, or £187 million over the next five years and £374 million over the next ten years. This takes no account of the income tax which these workers will be contributing when they return to work.'*[22]

In the years from 2009 to 2016 the number of people receiving a hip replacement increased from 72,432 to 101,651. This means that in 2016 just over 18,500 people returned to work that otherwise would not have done.[23]

Alongside this the total annual cost of Job Seekers Allowance has increased from £3,400 to £3,801. This means that in **2016 the saving to the UK economy was £70 million**. Over the next five years the saving will be **£352 million and £704 million** over the next ten years.

21 http://www.mtg.org.uk/wp-content/uploads/2017/01/Adding-Value-The-Economic-and-Societal-Benefits-of-Medical-Technology.pdf
22 Ibid
23 http://www.njrcentre.org.uk/njrcentre/Portals/0/Documents/England/newsletters/JA%202016/08519%20JOINT%20APPROACH%20AutumnWinter%202016%20WEB%20VERSION.pdf

Chapter 2: Implantable Cardiac Defibrillators

Over 100,000 people die suddenly each year in England from heart problems caused by 'fast' arrhythmias in the ventricles (conditions called ventricular tachycardia or ventricular fibrillation).

Implantable Cardiac Defibrillators (ICDs) treat people with arrhythmias (irregular, potentially fatal, heart rhythm disorders). Arrhythmias can affect people of all ages and cause sudden cardiac death if left untreated. There have been a number of high profile examples from the world of sport, such as footballer Fabrice Muamba, who collapsed during a Premier League football match in 2012, due to an arrhythmia. Thanks to treatment with an ICD he is able to lead an active life – although he is unable to return to professional sport.[24] Last year professional cricketer James Taylor was diagnosed with a similar condition to Muamba and he too has an ICD.[25]

Arrhythmias are caused by the electrical system in the heart causing the heart rhythm to be too fast, too slow or irregular. Ventricular arrhythmias are most common in people with underlying heart disease. They can happen suddenly and unexpectedly, and can cause sudden cardiac arrest leading to death. Arrhythmias cause 4 out of 5 deaths from sudden cardiac death in England and Wales.[26] The average survival of adults with an out of hospital episode of ventricular tachycardia or ventricular fibrillation has been reported as low as 7%. With appropriate treatment and secondary preventive strategies, recent studies have reported 5 year survival rate could increase from 69% to 100%.[27]

The impact

ICDs can extend the lives of people with heart conditions who are at risk of sudden cardiac death. ICDs are an effective treatment for those known to be at high risk, as the device has been shown to prevent death from sudden cardiac arrest 98 per cent of the time.

24 https://en.wikipedia.org/wiki/Fabrice_Muamba
25 https://www.theguardian.com/sport/2016/apr/16/what-forced-cricketer-james-taylor-to-retire-at-age-26
26 https://www.nice.org.uk/guidance/ta314
27 Ibid.

The technology

ICD stands for 'implantable cardioverter defibrillator'; often called an ICD or defibrillator. It is made up of a small, slim, box-shaped device which contains a battery and electronic circuits. The device is connected to your heart by wires known as leads. The leads are passed along a blood vessel to your heart and the ICD box is usually implanted under the skin in your upper chest, near your collar bone.

The ICD can recognise and monitor your heart rhythm and can administer treatments if needed. It also stores information about your heart rate and rhythm which can be accessed when you come to the clinic for follow-up.

Most modern ICDs have three main functions; however you may not need to use all of them. Your cardiologist will select what settings are best for your condition.

- If your heart rhythm is too slow, the device can give your heart extra beats by working as a normal pacemaker. This is called bradycardia pacing.
- If your heart beats too fast, the ICD can give you a burst of extra beats at an even faster rate which will possibly return your heart back to a normal rhythm. This is called anti-tachycardia pacing (or ATP).
- If the anti-tachycardia pacing does not bring your heart back to a normal rhythm, or if the ICD senses a faster rhythm called ventricular fibrillation, the ICD can then give one or more high energy shocks. This is called defibrillation.[28]

There is another type of ICD that is suitable for some people, called a subcutaneous (under the skin) ICD. A subcutaneous ICD works in the same way as an ICD, but the device is inserted just under the skin on the left side of the chest outside of the ribcage, and the lead sits just under the skin on top of the breastbone. With the subcutaneous ICD, there are no leads placed into the heart. Your doctor will talk to you about this option if it is right for you.

The Work Foundation Report on the societal benefits of medical technology found that the majority of patients receiving the device who were previously in work were able to return to work. Given the severity of their condition, this an achievement in and of itself, but the fact remains that the patients' recovery reduces systemic burden on resources when such individuals can begin again to function in accordance with their previous lifestyles and levels of employment. NICE found ICDs to be a cost-effective intervention in a wider patient population, particularly due to the increase in the battery life of ICDs.[29]

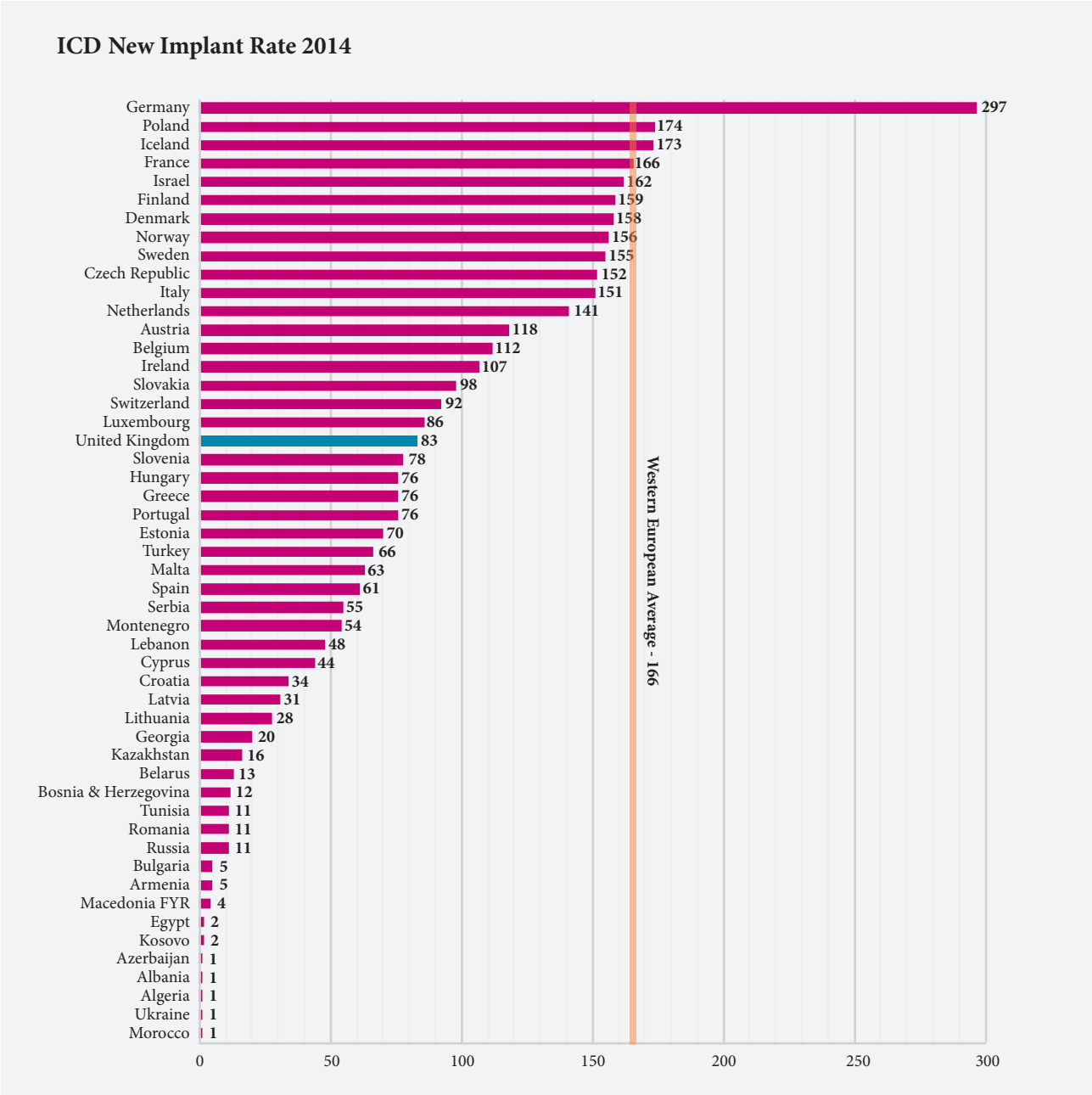
An article published in 2009 suggests that the cost-effectiveness of ICD therapy[30] when compared with medical and surgical therapy is €31,717 per QALY gained with the cost effectiveness ratio of ICDs below €50,000 per QALY.[31] The article also indicates that 70% of the per person cost for an ICD is related to the device and implant procedure costs, which confirms the high up-front costs of an ICD with benefits 'likely to accrue well beyond the duration of the clinical trial.'[32]

28 http://www.heartrhythmalliance.org/aa/uk/icds-icd
29 https://www.nice.org.uk/guidance/ta95
30 http://circ.ahajournals.org/content/91/8/2195
31 https://www.ncbi.nlm.nih.gov/pubmed/19359333
32 Ibid

UK implant rates (ICD)

In the ten years from 2004 to 2014 the ICD implant rate rose from 40 per million population to just over 80. Whilst this progress should be welcomed, England still lags well behind other West European countries.

The West European average is currently 166 per million population – almost double the average in England. In terms of the number of implants per million population, the UK lags behind countries such as Slovakia and Iceland.[33]



33 http://www.heartrhythmalliance.org/files/files/aa/for-clinicians/2014-15%20National%20Audit%20of%20Cardiac%20Rhythm%20Management%20Devices.PDF

The cost savings

The Work Foundation Report found that ICDs can help people back into work:

"Few studies have examined the impact of ICDs on work outcomes. However, as mentioned before, mortality associated with cardiovascular conditions leads to considerable losses in working years (Liu et al., 2002). Since ICDs extend lives, their use may lead to reductions in the loss of working years. With that said, of those participating in the Sudden Cardiac Death in Heart Failure Trial (SCD-HeFT) only 27 per cent were employed (Mark et al., 2008) and of those participating in a Dutch study examining quality of life 21 per cent were employed (Kamphuis, de Leeuw, Derksen, Hauer and Winnubst, 2003). On the other hand, the few studies that have examined this issue found that the majority of individuals who were employed prior to receiving an ICD were able to return to work after the procedure, thus improving quality of life outcomes (Kalbfleisch et al., 1989; Gurevitz et al., 2003). The majority of ICD recipients who want to work should be able to continue working, and this could have positive implications for quality of life (Sears and Conti, 2002) as well as on the overall economy."[34]

The current UK ICD implant rate is 83 per million population. The UK population is currently 66 million, which means that 5,478 people receive an ICD each year. Evidence shows that 21% per cent of patients with an ICD can return to the previous function of their lifestyle including returning to work, meaning that 1,150 are currently supported to work, reducing the burden on the UK welfare system by **£4.3m every year from patients receiving ICDs**. If the UK was to get the implant rate in line with the European average the savings would **double to over £8m**.

34 http://www.mtg.org.uk/wp-content/uploads/2017/01/Adding-Value-The-Economic-and-Societal-Benefits-of-Medical-Technology.pdf

Getting an ICD

For years, Fran was an energetic and incredibly sporty young woman. Throughout school and university she played football and rugby, swam regularly and was involved in everything she possibly could. With a very impressive resting heart rate of 58 Fran was a picture of health.

However, during a rugby game in January 2015 Fran experienced her first episode of the heart condition she was eventually diagnosed with, cardiomyopathy, which caused her to collapse. Fran was taken to A&E – albeit reluctantly – and despite feeling ill for the next two weeks shrugged off the collapse, carrying on with her active life as normal. She was referred to cardiac specialists in her home town of Sheffield but saw no reason to worry with what she was sure was a small incident caused by low blood sugar or something similar. This was not to last for too long however as she experienced another episode the day before she was due into hospital for her appointment.

This came when walking up one of Sheffield's hills. Feeling suddenly tired and dizzy, despite having done this trip dozens of times previously without any problems, she sat down to catch her breath. However, rather than her symptoms passing she began to feel worse and eventually passed out once again – this time on the pavement.

At her hospital appointment, Fran was tested for a number of conditions in order to pinpoint exactly what was the cause of these episodes and how they could be prevented in the future. Conditions such as syncope (fainting) were ruled out quickly and she was swiftly referred to more tests with cardiologists in the coming weeks. The tests were done over the next three months and it was the result of one of them – followed by an urgent MRI – that lead to Fran being diagnosed with cardiomyopathy.

This diagnosis was of course extremely difficult, but Fran was treated quickly and compassionately by the NHS staff and when referred to a consultant for his opinion on the best treatment, was operated on two days later. The treatment options available to Fran were extremely complex – but the options were explained carefully to her.

The option Fran chose was a device called a Subcutaneous Implantable Cardioverter-Defibrillator. This device is inserted underneath her skin, and provides an electrical current to the heart when it detects an abnormal rhythm to correct it.

Chapter 3: Insulin Pumps

There are around 400,000 people living with Type 1 diabetes in the UK, an auto-immune condition that cannot be reversed or prevented. Many people develop diabetes when they are young. Once someone develops Type 1 diabetes they will live with the condition for the rest of their lives. People with Type 1 diabetes are required to monitor their blood glucose levels and administer insulin throughout the day. Technology plays a key role in people managing their condition effectively and leading full and active lives. Technologies that support people range from simple test strips through to insulin pumps and continuous glucose monitors.

Type 1 and Type 2 diabetes is responsible for around 10% of NHS spending. The vast majority of this is spent on people with Type 2 diabetes, with around 10% being spent on Type 1. 80% of the cost of Type 1 diabetes is spent on treating complications – many of which are avoidable.

Effective control of blood glucose levels is a key factor in avoiding complications and reducing costs. Technology such as insulin pumps can support people to manage their condition more effectively. NICE has approved the use of insulin pumps for people with Type 1 diabetes[35], which means all patients eligible for an insulin pump should get funding, something that is not always the case. The NICE Technology Appraisal for insulin pumps was first published in 2003, updated in 2008 and is still relevant today. Uptake and use of pumps, has however, been very slow.

35 https://www.nice.org.uk/guidance/ta151

The technology

An insulin pump is a small device, about the size of a small mobile phone. The device is worn on the outside of the body and allows the user to programme their background insulin needs and have insulin delivered at any point. With injections, once you have given your background insulin dose the dose is gradually absorbed over the day and cannot be increased or decreased according to each day's changing circumstances.[36]

Insulin pumps help the user better manage blood glucose levels over night so they can help to reduce the chances of having a night time hypo.[37]

The Diabetes Control and Complications Trial showed that the most effective way to prevent complications is through the control of blood glucose levels. This can help avoid complications such as blindness, amputations, kidney failure, and heart disease.[38]

How technology can help

Insulin Pumps: NICE have recommended that people with Type 1 diabetes should be given access to insulin pump therapy. The NICE recommendation committee concluded that the use of insulin pumps had 'valuable effect on blood glucose control', yielded 'quality of life benefits' and significantly decreased 'episodes of hypoglycaemia'.[39] NICE guidance also states that patients should be given access to a specialist pump team. Pumps can play a key role in helping people better manage their short and long term blood sugar levels, helping reduce adverse events and complications, and therefore reduce costs. It is important that people with Type 1 diabetes are offered a pump and access to a specialist pump team, along with annual HbAc1 checks.

Self-monitoring of blood glucose: NICE guidance on when people with Type 1 diabetes should test is clear – people should test at least four times a day, before bed and before meals. Standard procedure for checking blood glucose levels involves people using a test strip and pricking their finger. A recent survey from Diabetes UK showed that 27% of people have been refused a prescription for test strips in the last 12 months.[40]

In NICE Guideline 17, 'Type 1 diabetes in adults: diagnosis and management'[41] and 'Nice Guideline 18 Diabetes (Type 1 and Type 2) in children and young people: diagnosis and management'[42] it is stated that people with diabetes can be offered Continuous Glucose Monitoring (CGM). CGM can be used whether you wear a pump or use injections for your insulin delivery so that the wearer can take action to bring glucose levels back to a safe and healthy range. CGM systems work 24 hours a day and some include alarms to indicate when your glucose levels are too high or too low. By providing as many as hundreds of readings a day, Continuous Glucose Monitoring allows people with diabetes to see not only their present glucose level but also the trend and the direction it is heading[43] - much like a movie instead of occasional photographs. CGM has NICE guidance but not a Technology Appraisal, which leads to a high level of variation when it comes to patients being given access.

36 http://www.diabetes.co.uk/insulin-pumps/nocturnal-hypos-and-insulin-pumps.html
37 Ibid
38 http://www.inputdiabetes.org.uk/alt-insulin-pumps/what-is/
39 https://www.nice.org.uk/guidance/ta151/chapter/4-Evidence-and-interpretation#consideration-of-the-evidence
40 https://www.diabetes.org.uk/professionals/position-statements-reports/diagnosis-ongoing-management-monitoring/access-to-test-strips-a-postcode-lottery
41 https://www.nice.org.uk/guidance/ng17
42 https://www.nice.org.uk/guidance/ng18
43 http://www.diabetes.co.uk/cgm/continuous-glucose-monitoring.html

Patient access to technology

Expert opinion in this area is clear – insulin pumps have a role to play in supporting people with Type 1 diabetes to manage their glucose levels and avoid complications whilst living an active independent life. NICE guidance supports this and recommends some people with Type 1 diabetes should be given access to insulin pumps.

There are also a number of published papers that support this. An editorial published by Pickup et al, 2008 states:

"The evidence base for estimating the percentage of people with Type 1 diabetes likely to benefit on clinical grounds has been discussed recently and estimated at about 15–20%."[44]

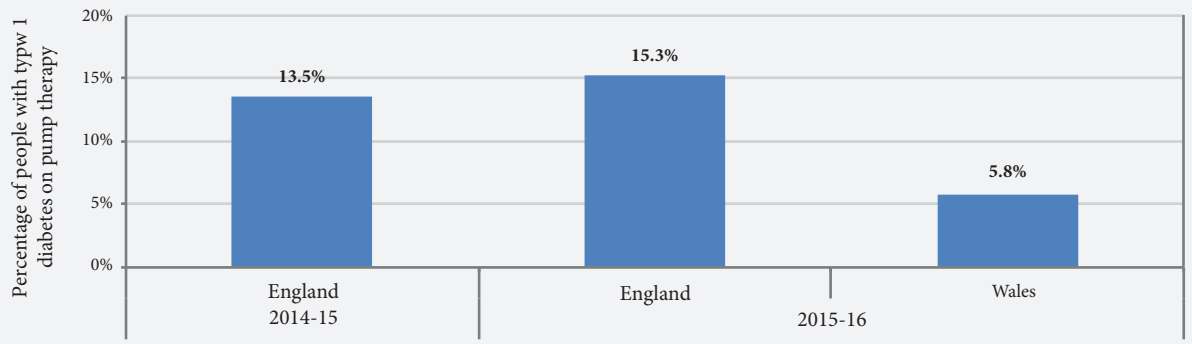
The Association of British Clinical Diabetologists (ABCD) paper on the Standards of care for management of adults with type 1 diabetes, published in 2016, clearly states that:

"All patients who have a HbA1c >69 mmol/mol despite optimised MDI should be offered an insulin pump."[45]

The National Diabetes Audit found that people with Type 1 diabetes are less likely to achieve HbA1c targets – 15% of Type 1 patients have HbA1c above 86mmol/mol, compared to only 6% of Type 2 patients.[46]

Patient access to insulin pumps has, however, been slow. The National Diabetes Audit, published in July 2017, shows that overall uptake has grown but is still hugely varied and at the bottom end of the 15-20% experts have recommended.

Percentage of people with Type 1 diabetes on an Insulin pump, by audit year [47]



Variation

The National Diabetes Audit collects data from diabetes centres on treatment of diabetes and access to pumps. There is still huge variation from centre to centre that is likely to govern whether or not patients are given access to insulin pumps with uptake of insulin pumps ranging from 5% up to 60% in the National Diabetes Audit published in 2017.

The variation in access is stark – a number of Trusts only have 1 in 20 people or less on an insulin pump, compared to some Trusts that support almost 7 out of 10 people to access a pump.

Additionally the audit looks at whether people with Type 1 received structured education for their diabetes care. 6 Trusts registered 0% of people with Type 1 diabetes receiving structured education, whilst

44 http://care.diabetesjournals.org/content/29/6/1449
45 http://www.diabetologists-abcd.org.uk/Position_Papers/Type_1_standards_of_care.pdf
46 http://digital.nhs.uk/catalogue/PUB19900
47 https://digital.nhs.uk/catalogue/PUB30027

20 Trusts stated that 100% of people with Type 1 Diabetes receive structured education.[48] Delivering a structured education service relies on having the right staff in place to support people with Type 1 diabetes. A recent audit of Specialist Diabetes Nurses by Diabetes UK found that over 30% of nurses said they currently have unfilled posts in their Trusts and 78% of nurses thought their workload was having an impact on patient care and/or safety.[49] Pressure on staff means that nursing teams are unable to deliver the right level of training and education in relation to pumps, also a factor that is limiting access.

The cost savings

The evidence is clear – insulin pumps can support some patients to manage their condition and avoid complications which can help contain costs. In 2011 the Work Foundation Report, 'Adding Value: The Economic and Societal Benefits of Medical Technology', found that:

"Evidence suggests that between £23,000 and £38,000 is saved each year on every 100 patients who use insulin pumps."[50]

The most recent National Diabetes Audit showed that 15% of people are currently using an insulin pump, this equates to around 60,000 people benefiting from the technology. Given the savings that can be generated through the use of insulin pumps, supporting this number of people to access insulin pumps **generates NHS savings of between £13.8m and £22m**.

48 Ibid
49 https://www.diabetes.org.uk/professionals/position-statements-reports/healthcare-professional-staffing-competency/dsn-survey-2016
50 http://www.mtg.org.uk/wp-content/uploads/2017/01/Adding-Value-The-Economic-and-Societal-Benefits-of-Medical-Technology.pdf

Living with an insulin pump

Melissa was diagnosed with type 1 diabetes in March of 1994, aged 12. Taken out of school to spend a week in hospital, she asked her mother to bring her all the books she could buy on diabetes at the local bookshop. Melissa and her family adjusted to the 'new normal' of several fingerstick blood tests a day and 2 daily insulin injections, which increased to 3-4 injections after a year. But insulin injections did not control Melissa's diabetes very well, and her quality of life was affected by having to stick to strict mealtimes and fixed menus. Further, Melissa was not able to exercise safely and she became overweight.

Melissa's diabetes nurse in her hometown of Fredericksburg, Virginia, suggested that she try an insulin pump. Despite her initial scepticism, after a few weeks Melissa never looked back and has been using a pump for over twenty years. Insulin pump therapy is fully funded by the NHS for patients like Melissa who meet clinical criteria outlined in NICE Technology Appraisal 151.

Thanks to insulin pump technology, for most of her 24 years with diabetes, Melissa's control has ranged between good and excellent. Unfortunately, however, Melissa is also among the estimated 20% of people with type 1 diabetes who cannot reliably sense when they are having a low blood glucose level (hypoglycaemia). As an adaptation to the frequent mild-moderate episodes of hypoglycaemia that come along with tight control of type 1 diabetes, her brain no longer triggers an adrenaline response when her glucose level goes below normal. Hypoglycaemia unawareness puts a person at risk of losing consciousness before they can self-treat a low glucose level. Hypoglycaemia unawareness can even contribute to sudden death. After two severe hypoglyacemic episodes in 2006, Melissa obtained a continuous glucose monitor (CGM) to alert her to out-of-range glucose levels. She fully self-funded this technology for three years before receiving partial NHS funding for it.

With CGM complementing her insulin pump, Melissa has had no further episodes of severe hypoglycaemia. She can exercise safely, maintains a healthy weight and has even completed long-distance cycling challenges to raise money for charity. She has travelled across the US and Europe on her own. She had a healthy pregnancy in 2014-15 and her little boy James is now two-and-a-half years old.

Chapter 4: Sepsis

Sepsis is a life-threatening illness caused by the body's response to an infection. Your immune system protects you from many illnesses and infections, but it is also possible for it to go into overdrive in response to an infection.

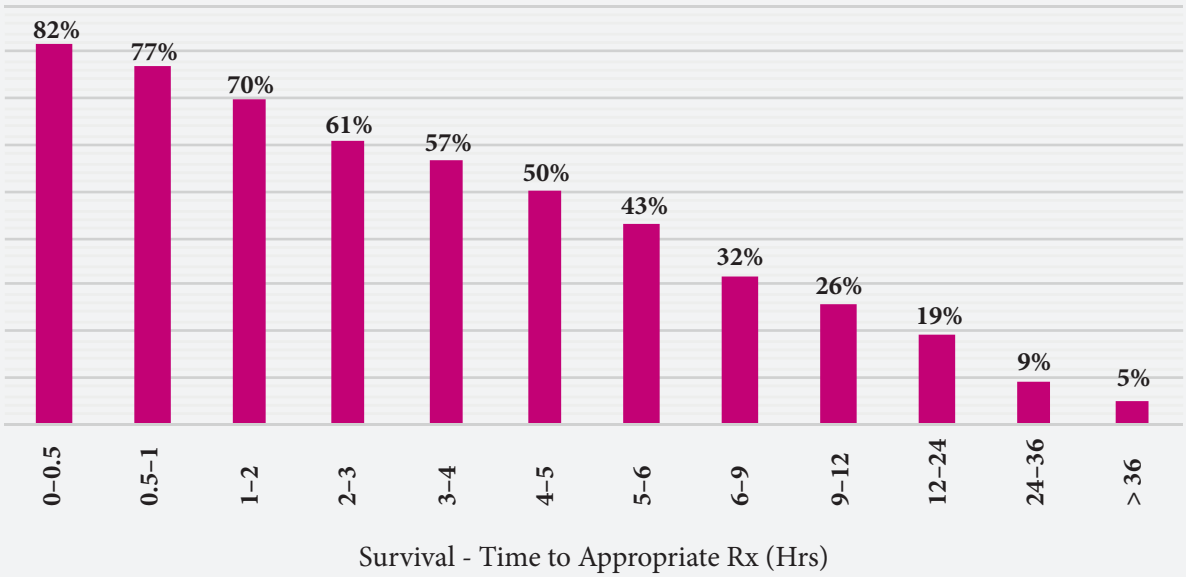
Sepsis develops when toxins of the immune system release into the bloodstream to fight an infection and cause inflammation throughout the entire body instead.[51]

In the UK there are 260,000 instances of sepsis every year, causing 31,000 deaths.[52] Treatment is time-sensitive, depends on early identification and antibiotic susceptibility, and has the potential to significantly improve patient outcomes.[53] Specific emphasis on appropriate triage to ensure prompt diagnosis of the high-risk patient is vital to the launch of a coordinated and cooperative effort by the primary treating clinician and the intensivist.[54] Previous guidelines have recommended the routine use of screening devices for patients suspected of sepsis for early identification, allowing implementation of early sepsis therapy.[55] Because the potential reversibility of this disease may be greatest during the earliest stages of presentation, and because of the potential mortality, proper sepsis management should not be confined within the walls of an ICU.

51 http://www.healthline.com/health/sepsis#overview1
52 https://www.gov.uk/government/news/new-action-to-reduce-sepsis
53 https://www.ncbi.nlm.nih.gov/pubmed/25441033
54 https://www.researchgate.net/profile/Emanuel_Rivers/publication/7519797_Early_and_innovative_interventions_for_severe_sepsis_and_septic_shock_Taking_advantage_of_a_window_of_opportunity/links/540532f00cf2bba34c1d2c38/Early-and-innovative-interventions-for-severe-sepsis-and-septic-shock-Taking-advantage-of-a-window-of-opportunity.pdf
55 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4489775/

Impact on survival of time to diagnosis:

Time to Appropriate Rx vs Survival - Septic Shock



The technology

For patients rapid diagnosis can mean the difference between life and death. Successful diagnosis requires the identity and susceptibility of the pathogen to be ascertained. In today's routine diagnostics, blood culture is the standard method for diagnosing sepsis and identification of microorganisms is based on sub-culturing the positive blood culture bottles.[56] All patients who are suspected of having sepsis should be given rapid access to accurate diagnostics to ensure an effective treatment is administered as soon as possible.

The UK Sepsis Trust has set out the key steps that should be followed to manage patients effectively, they are known as the Sepsis Six:

- Titrate oxygen to a saturation target of 94%.
- Take blood cultures.
- Administer empiric intravenous antibiotics.
- Measure serum lactate and send full blood count.
- Start intravenous fluid resuscitation.
- Commence accurate urine output measurement.[57]

56 https://openarchive.ki.se/xmlui/handle/10616/45244
57 http://sepsistrust.org/

The impact

It is estimated that 11,000 lives and **£160 million could be saved every year** through better diagnosis and treatment.[58] The UK Sepsis Trust estimates there could be a saving of £4,000 per episode through rapid diagnosis.

Identifying patients earlier and avoiding more severe cases helps save money in a number of ways. Firstly it can reduce the amount of time patients spend in intensive care, the most expensive care setting within a hospital.

Some patients might also experience Post Sepsis Syndrome. This is a group of long term conditions that can come after severe sepsis, during the rehabilitation period. The effects of this can be both physical and psychological. Patients may suffer from lethargy and excessive tiredness, poor mobility and breathlessness, insomnia, and repeated infections. Patients may also suffer from depression and anxiety following severe sepsis.[59]

The impact of sepsis from the UK Sepsis Trust

After feeling unwell Stephanie went to see her GP but was told that she was suffering with a common cold. Her throat got so bad that she was unable to eat and began to lose weight. Stephanie returned to her GP five times but was sent away with a prescription for mouth wash.

Eventually Stephanie became so ill that she had to be rushed to hospital by her boyfriend. She was so weak that she was potentially hours from death, upon being admitted to hospital doctors revealed that she had pneumonia which led to her developing sepsis.

Sepsis causes the body's immune system to go into overdrive and reduces the blood flow to vital organs. Effective treatment of sepsis relies on accurate diagnosis. The longer it takes to get an accurate diagnosis the worse the outcome is likely to be.

Unfortunately for Stephanie the severity of her condition meant she had to have a large dose of antibiotics which led to ulcerative colitis. Her colon ended up so badly damaged she had to have it removed[60] and now lives with a stoma bag.

Speaking of her experiences, Stephanie said 'I now wear a stoma bag, which I wanted to rip off at first, but I realised life is just too short and a year on from my operation I now embrace it and realise how lucky I am to be here today.

'It's hard to believe that a sore throat could completely turn your life upside down, but I now urge others to trust their instinct and always ask for help.'

58 https://www.gov.uk/government/news/new-action-to-reduce-sepsis
59 http://sepsistrust.org/public/recovering-from-sepsis/
60 http://www.dailymail.co.uk/health/article-3684175/Mother-sore-throat-left-needing-colostomy-bag-25-year-old-thought-flu-suffering-deadly-sepsis-ravaged-bowel.html

Chapter 5: Uterine Fibroid Embolisation

Uterine fibroids are the most common non-cancerous tumours found in the human body consisting of muscle tissue in the womb. They can vary in size from a bean to a melon. Excessive menstrual bleeding is one of the most common symptoms for fibroids, along with infertility and painful periods. People suffering with fibroids will often pass blood clots and see longer bleeding and monthly periods. If left untreated it can lead to fatigue and anaemia – potentially requiring blood transfusions.

Larger fibroids can put pressure on organs and lead to lower abdominal pain. This can also be caused by the location of fibroids, not only the size. One of the organs commonly affected during the growth of the fibroid tumours is the bladder. As added pressure is applied to this organ, the risk of urinary incontinence, or the loss of bladder control, as well as frequent urination increases. Not only can this cause a great deal of pain and discomfort, but it can also become a hindrance in everyday activities.

Another possible effect of uterine fibroid tumour growth can be increased pressure to the bowel. This can cause uncomfortable constipation and/or bloating.[61]

61 http://ask4ufe.com/what-are-uterine-fibroids/symptoms/

The technology

Uterine Fibroid Embolisation (UFE), is an image-guided, minimally invasive procedure used to treat patients with symptomatic uterine fibroids.

A high-definition x-ray camera is used to guide a catheter with a diameter of about 2 mm into the uterine arteries to deliver particles of an embolic material - these particles stop the supply of blood and cause fibroids to shrink.

Uterine embolisation[62] is carried out under conscious sedation; no general anaesthetic or surgery is involved. Therefore:

- There is no surgical wound to heal and muscles are not cut - only a tiny incision site that heals completely and leaves no scar
- Only the fibroids are affected
- The uterus and all reproductive organs remain intact
- Hospital stay is normally overnight compared with 5-10 days for hysterectomy surgery
- The recovery time is much shorter than surgery, 1-5 weeks compared with 2-3 months
- Return to work and normal life is much quicker, 1-3 weeks
- There is no restriction on lifting or driving after embolisation

One of the key benefits for women is that they remain fertile and can have a successful pregnancy after embolisation. Embolisation is far less invasive, allowing women to return to normal life much quicker.

The impact

It is estimated that between 20 to 80% of women of reproductive age have fibroids, although not all are diagnosed.[63 64] Some estimates state that up to 30 to 77% of women will develop fibroids sometime during their childbearing years, although only about one-third of these fibroids are large enough to be detected by a healthcare provider during a physical examination. Women who are approaching menopause are at the greatest risk for fibroids because of their long exposure to high levels of oestrogen.[65]

Fibroids are incredibly common, studies have shown that most American women will develop fibroids at some point in their lives. One study found that, by age 50, 70% of white women and 80% of African Americans had fibroids.[66] In many cases, fibroids are believed not to cause symptoms, and in such cases women may be unaware they have them. Although various therapies are used to treat symptoms, including drugs or surgical removal of individual fibroids, when the condition is painful or the number of fibroids is great, doctors may advise surgery to remove the uterus—a hysterectomy. In the USA more than 200,000 hysterectomies are performed each year for uterine fibroids. Annual direct health care costs for uterine fibroids exceed $2.1 billion.[67]

In the NHS in England alone, in 2014-15 64,500 women were diagnosed with fibroids (leiomyoma of the uterus and other benign neoplasms of the uterus)

62 http://www.femisa.org.uk/index.php/treatment-options/embolisation/benefits-and-disadvantages-of-uae#Benefits-of-UAE
63 https://academic.oup.com/humrep/article/19/10/2350/588954/Uterine-leiomyoma-and-menstrual-cycle
64 https://www.ncbi.nlm.nih.gov/pubmed/2220671
65 http://obgyn.ucla.edu/fibroids
66 https://report.nih.gov/nihfactsheets/viewfactsheet.aspx?csid=50
67 Ibid

and 72,584 with heavy menstrual bleeding, making treatment a significant public health issue.[68]

A clinical study from USA on the total costs of fibroids to the healthcare system and to the economy as a whole was published in 2012.[69]

It stated that:

Estimated annual direct costs (surgery, hospital admissions, outpatient visits, and medications) $4.1-9.4 billion

Estimated lost work-hour costs - annually $1.55-17.2 billion

Obstetric outcomes that were attributed to fibroids $238m - $7.76 bn

Total costs attributed to fibroids annually $5.9- $34.4 billion

The savings

Treatment for fibroids can be through medication, hysterectomy, myomectomy, or embolisation. Very few patients will be unsuitable for embolisation, but many have surgery without choice. However, there are clear benefits to embolisation. Embolisation is far less invasive than a hysterectomy. For patients the benefits are obvious – they do not need to go through a traumatic operation that leaves them infertile. Embolisation also has a much shorter recovery period, with patients normally returning to work in one to two weeks, as opposed to 10 weeks for hysterectomy.

Two weeks off in place of 10 weeks equates to 152,000 working days saved every year. The ONS has stated that average weekly earnings are £503. **This equates to a societal saving of £76m per year for earlier return to work only**.[70]

68 https://digital.nhs.uk/catalogue/PUB19124
69 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3292655/
70 http://www.femisa.org.uk/index.php/cost-comparisons

Chapter 6: Pain Management

Chronic pain is often defined as pain that lasts longer than 12 weeks. Acute pain alerts us to an injury and generally lasts for a short period of time. Chronic pain is very different in that it persists for months and years.[71] Chronic pain can become all-consuming for some people and leave them unable to work, socialise and lead full and active lives. Estimates have said that the prevalence of chronic pain could be anywhere from 7% to 45% in the UK.[72] 1 in 5 patients reporting that they had chronic pain said that it persisted for over 20 years.[73]

One study across Europe showed that 19% of adults suffered chronic pain of moderate to severe intensity.[74] The study found that pain was having a huge impact on patients' lives:[75]

Daily Life

- 65% were less able or unable to sleep
- 31% said their pain was so bad they could not tolerate anymore
- 24% of respondents in the United Kingdom had been diagnosed with depression by a medical doctor

Employment

- 32% were no longer able to work outside their homes
- 25% had lost their job
- 16% had changed job responsibilities and 18% had changed jobs entirely

Mobility

- 24% could no longer drive
- 40% were less able to walk

Lifestyle

- 34% of the respondents were less able to attend social activities
- 50% said they were less able to exercise

71 https://medlineplus.gov/magazine/issues/spring11/articles/spring11pg5-6.html
72 https://www.ncbi.nlm.nih.gov/pubmed/10520633
73 http://www.pae-eu.eu/wp-content/uploads/2013/12/Survey-of-chronic-pain-in-Europe.pdf
74 Ibid
75 Ibid

It is reported that 13% of British patients suffer from chronic pain. With 2017 population levels that is 8.5 million people living with chronic pain.[76]

The technology

Spinal cord stimulation (SCS) can relieve chronic intractable pain by stimulating nerve fibres in the spinal cord. The impulses from the stimulation machine in the nerve fibres may inhibit the conduction of pain signals to the brain and the sensation of pain is then blocked. There is a growing number of patients requiring treatment other than conventional medicine that have a need for SCS.[77] 64% of patients have reported that their pain medication is inadequate at times.[78]

The expected benefits of SCS are a reduction in pain, improved quality of life and a potential reduction in the usage of pain medication.

NICE recommendation

NICE conducted a clinical and cost effectiveness review of spinal cord stimulation in 2008 and reviewed their guidance in 2014. Upon their review of the available evidence NICE were clear – spinal cord stimulation is both clinically and cost effective. NICE TA 159, "Spinal cord stimulation for chronic pain of neuropathic or ischaemic origin" clearly states:

"Spinal cord stimulation is recommended as a treatment option for adults with chronic pain of neuropathic origin who:

- *continue to experience chronic pain (measuring at least 50 mm on a 0–100 mm visual analogue scale) for at least 6 months despite appropriate conventional medical management, and*
- *who have had a successful trial of stimulation…"* [79]

Neuropathic pain

Prevalence reports have estimated the neuropathic back and leg pain prevalence in the UK to be 5,800 per 100,000 population.[80] This means over 400,000 people are suffering from neuropathic back and leg pain, costing approximately £2bn, from a societal perspective. An estimate of approximately 4,051 patients a year would be suitable for SCS if just 1% of the estimated chronic pain population were considered suitable for SCS.

Evidence shows that 25% of patients that have chronic pain lose their job. With an estimate of 4,051 patients eligible for SCS, we would see an extra 1,000 people per year back in work and not in benefits if given SCS, **saving £3.8m every year**.

Recent figures from the NHS show that around 1,200 people receive a chronic pain device each year. This means that 2,800 people are missing out on the device and the chance to return to work. **This could potentially be saving the UK taxpayer £2.66m per year** in spending on Job Seekers Allowance.

76 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4173369/
77 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4173369/
78 http://www.pae-eu.eu/wp-content/uploads/2013/12/Survey-of-chronic-pain-in-Europe.pdf
79 https://www.nice.org.uk/guidance/ta159/chapter/1-Guidance
80 https://www.ncbi.nlm.nih.gov/pubmed/17309705

Dealing with pain

Dean Walker was an avid water polo player, making the team to represent Great Britain, until a serious work accident in 2006 changed his life.

Initially Dean didn't realise the severity of what happened and even went back to work the following day. After 3 months, the pain was so bad that Dean was unable to cope with it and took himself to see his GP. Initially pain medications such as paracetamol and opiates were prescribed and over the next few years many combinations of drugs were tried by the doctors. It turned out that the accident had essentially broken Dean's back but only due to his athletic fitness did it hold together. Within a year of the accident Dean's pain was so severe that he had to stop working altogether. For the next 4 or 5 years, Dean was prescribed many different pain killers and combinations to help control the pain but they never truly worked and gave little more than a few minutes of temporary relief and sometimes had significant side effects.

In 2011, Dean was finally referred to a pain consultant at his local hospital after years of chronic debilitating pain. Fortunately, the Pain Consultant who saw Dean was aware of spinal cord stimulation technology, and referred Dean to the Pain Management Programme at Guys and St. Thomas' Hospital to find out if it would be suitable for him.

Dean felt dramatic pain relief immediately. His pain went from being unbearable to feeling absolutely no pain at all. Because the therapy was clearly working, in 2012, Dean was implanted with the permanent stimulator at Guy's and St Thomas' Hospital, allowing him to continue to benefit from the treatment and feel this dramatic relief on an ongoing basis. Consequently, Dean was able to return to work within the next few months and since that time has worked full time and coaches swimming for his local club. Some 4 years after receiving his spinal cord stimulator, Dean continues to be amazed at the difference the device has made to his life.

Alongside being back at work full time Dean regularly swims, takes long walks, and has even played water polo. Dean credits his GP, Pain Consultant, and Guys and St. Thomas' for helping him through this very difficult time and ultimately helping him gain access to the technology that gave him his life back.

Chapter 7: Wound Management

The scale of the problem

A chronic leg ulcer is defined as a defect in the skin below the level of knee persisting for more than six weeks which shows no tendency to heal after three or more months. Leg ulcers are notoriously difficult to treat/heal and can lead to complications including loss of mobility and risk of infection, which in turn can lead to more serious conditions such as infection and amputation.

Factors that can increase a person's risk of chronic venous leg ulceration include age. Older people have a higher risk of developing arterial and venous incompetence. Improved life expectancy means the number of people with ulcers is likely to rise. Research identifies chronic leg ulcers affecting up to 3 per cent of those aged over 60, increasing to over 5 per cent of those aged over 80.[81] Leg ulcers are often an indication of a long-term condition, such as diabetes or rheumatoid arthritis. As part of the assessment process, the underlying ulcer aetiology is identified, to make rational, safe and effective treatment decisions.

As well as decreased mobility and loss of functional ability there are associated social impacts such as poor quality of life. In a study of 190 patients with chronic venous ulcers in North West England, 27 per cent scored as depressed and 26 per cent scored as anxious using the Hospital Anxiety and Depression Scale[82]. The symptoms associated with anxiety and depression were pain and odour. If these factors are not addressed, there is a higher risk of non-concordance which may prevent healing with a significant further deterioration in their overall physical and mental health.

81 https://www.hindawi.com/archive/2013/413604/
82 http://www.magonlinelibrary.com/doi/abs/10.12968/bjon.2013.22.Sup4.S3

Cost implications

Leg ulcers are costly and slow to heal, and after healing, up to 70 per cent recur. Health systems are slow to embrace the long-term chronic disease management and health promotion approach needed for effective management amongst older adults with peripheral vascular disease, who experience years of leg ulceration and recurrence cycles.

Venous leg ulcers (VLU) cost £168-198 million per year[83] and current reports indicate that financial costs associated with leg ulcer management are approximately at 1.3 per cent of the healthcare budget in the UK.

During the past 10 years, there has been an abundance of literature written about the incidence rate of leg ulcers and the high cost of management. With an ageing population, increasing incidence of long-term conditions and a very challenging financial environment, this is a significant challenge for healthcare commissioners and providers.

At the same time clinicians must recognise the changing nature of medical technology and be proactive in taking into account expectations of health promotion and education designed to prevent disease.

Pain and Stress of Living with a Chronic Wound

Physiological effects

- Delayed healing
- Increased morbidity
- Decreased quality of life

Psychological effects

- Depression
- Low self-esteem & social isolation
- Anxiety & Mood disorders

Costs

Financial costs to patients

- Expenditure on specialist items
- Travel to appointments
- Anxiety & loss of earnings
- Prescriptions

Financial costs to society

- Prolonged wound treatment
- Treatment for psychological disorders
- Social care
- Loss of income tax revenue
- Increased benefit payments
- Lost active contribution to society

83 http://www.woundsinternational.com/media/issues/707/files/content_10968.pdf

New generation technology

Research and development leads to innovation to treat patients more effectively, giving better outcomes and increased quality of life. Some innovations are cost neutral, others increase treatment cost, while a few offer considerable overall cost savings.

However, barriers to technical innovation include the slow uptake of new ideas. The treatment of venous leg ulcers is a case in point. Historically VLU have been treated with compression by applying various layers of single use bandages to the leg. This requires considerable nursing skill and time to apply the correct pressure, many bandage changes each week and variable outcomes for the patient. Patient concordance can be poor, resulting in less than ideal healing rates with on-going treatment costs to the NHS.

The development of new and effective interventions in wound care remains an area of intense research. Extensive research has shown that compression therapy, for example, compression hosiery, short-stretch (inelastic), or four-layer (elastic), long-stretch bandaging, is the recognised 'gold standard' treatment of choice for venous leg ulcers. Graduated compression therapy is cost-effective with fast healing rates — 40– 80 per cent of ulcers heal within 12 weeks. Compression therapy not only has a central role in the treatment of active venous ulceration, but also a prophylactic one in the prevention of venous ulcer occurrence or recurrence.

However, modern materials and advancements in technology have enabled today's manufacturers to produce compression systems which are aesthetically acceptable to patients leading to concordance of treatment.

Research has shown that compression therapy is one of the best treatment options for venous leg ulceration. New generation compression wraps benefit patients (or carers) since they are able to apply their own compression therapy which reduces clinician input leading to significant cost savings. Also, involving patients in their own care can lead to a positive impact on compliance and clinical outcomes. Recent innovation in the wrap system applies a measurable, adjustable compression to the leg as a reusable wrap, designed to give six months of daily wear to treat and heal VLUs. In a recent study compression cost to treat 26 patients were reduced by over £14,550 by using a wrap system rather than bandages. The product applied measurable compression saving a further £5,380 in dressings in the same patients. Nursing time spent treating the 26 patients was reduced by 32 hours per week. In product costs alone the savings using the wrap was reduced from £1,147 to £380 per patient every six months. Nursing time saved each week was over 32 hours – one full time nurse.

Barriers to acceptance of new technology in treating VLUs:

- Long standing traditional prescribing practices rarely questioned.
- Misunderstanding of cost.
- Shift outcome targets from leg ulcer management to leg ulcer healing.

Medical technology in wound management is continually advancing and there are currently new and advancing ways in which leg ulcers can be managed. Although the mainstay of leg ulcer management has been dressing and bandaging, there is increasing evidence that surgical intervention can cure a certain proportion of these leg ulcers.

Conclusion

It is estimated that there are 2.2 million wounds treated by the NHS each year, with over 100,000 of these being venous leg ulcers.[84] Treating patients effectively requires significant resources, including 18.6 million practice nurse visits, 10.9 million community nurse visits, 7.7 million GP visits, and 3.4 million hospital outpatient visits. The estimated annual cost to the NHS is £5.3bn.[85]

84 https://www.nursingtimes.net/Journals/2015/06/05/q/f/y/The-burden-of-chronic-wounds-in-the-UK.pdf
85 http://bmjopen.bmj.com/content/5/12/e009283.full?sid=9fa6af25-1311-4f88-bc39-6d2acde07546

Awareness of leg ulcer management has grown and in the UK healthcare providers and commissioners now recognise the need to provide effective care. However, how the NHS is funded and how services are procured presents new challenges and opportunities for NHS providers.

There is pioneering research and practice innovations currently being undertaken and new generation compression therapy is a mainstay treatment of a venous ulcer with quality evidence to support compression therapy in the treatment of venous ulcers.

The savings

One study looked at the benefits of using two layer cohesive compression bandages ahead of other types of wound dressings. This study found that the average six monthly cost for the two layer cohesive compression bandage was £2,413, whereas other systems cost £2,707 – a potential saving of £235 per patient.[86]

This equates to a saving of £235 per patient per year. Given the patient population is 108,000 per year, **this equates to £25.3m of savings every year**.[87]

86 https://www.researchgate.net/profile/Julian_Guest/publication/280393120_Clinicaoutcomes_and_costeffectiveness_of_three_alternative_compression_systems_used_in_the_management_of_venous_leg_ulcers/links/5735e91608ae9f741b29c5a3.pdf
87 https://www.nursingtimes.net/Journals/2015/06/05/q/f/y/The-burden-of-chronic-wounds-in-the-UK.pdf

Chapter 8: Percutaneous Coronary Interventions

Cardiovascular disease (CVD) is the term used to describe conditions of the heart and circulation. CVD causes more than a quarter (26 per cent) of all deaths in the UK, nearly 160,000 deaths each year – an average of 435 people each day or one death every three minutes.[88] CVD covers a range of areas including coronary heart disease, strokes, peripheral arterial disease and aortic disease. This chapter will focus on coronary heart disease, the narrowing of arteries that leads to the flow of oxygen rich blood to the heart being reduced.[89] The result of reduced blood flow can be angina, a form of chest pain, a heart attack or heart failure.

Living with CVD has a huge impact on a patient's quality of life. Studies have shown that CVD has a negative impact on health related quality of life.[90] It is estimated that there are over 7 million people living with the condition in the UK. Studies have shown that the total direct health care costs of coronary heart disease in the UK is £1.73 billion. On top of this costs are estimated at £2.42 billion in informal care and £2.91 billion in friction period adjusted productivity loss.[91]

The major costs were those used for hospital inpatient care, which accounted for £917 million (or 53% of the total) and drug treatment, which accounted for £558 million (or 32% of the total). Rehabilitation and community care, prevention and primary care, and A&E and outpatient care accounted for 7.4%, 3.6%, and 2.9%, respectively, of total direct costs. 37% of this spending is on people of working age and 52% is on men.

For families and those caring for people with heart disease the burden is enormous. An estimated 401,000 people provided informal care to coronary heart disease patients in the UK, and about 408 million hours were used to care for them.[92]

88 file:///C:/Users/Dan%20Jones.PBPC-5VRJXF2/Downloads/bhf-cvd-statistics---uk-factsheet%20(1).pdf
89 http://www.nhs.uk/conditions/cardiovascular-disease/Pages/Introduction.aspx#types
90 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4666873/
91 http://heart.bmj.com/content/88/6/597
92 Ibid

The impact on the UK economy is staggering. Overall CVD is estimated to cost the UK economy £30.7bn a year. Of the total cost of CVD to the UK, around 47% is due to direct health care costs, 27% to productivity losses, and 26% to the informal care of people with CVD. Overall, Coronary Heart Disease (CHD) is estimated to cost the UK economy nearly £9bn a year. Of the total cost of CHD to the UK, around 36% is due to direct health costs, 43% to productivity losses, and 21% to the informal care of people with CHD.[93]

Studies have shown that 150,565 working years were lost from deaths from coronary heart disease in England and Wales. 71% of these working years lost were from deaths in men in the 45–64 year age range. It estimated that each year 65.4 million working days are lost because of incapacity resulting from coronary heart disease in the UK.[94]

The treatment

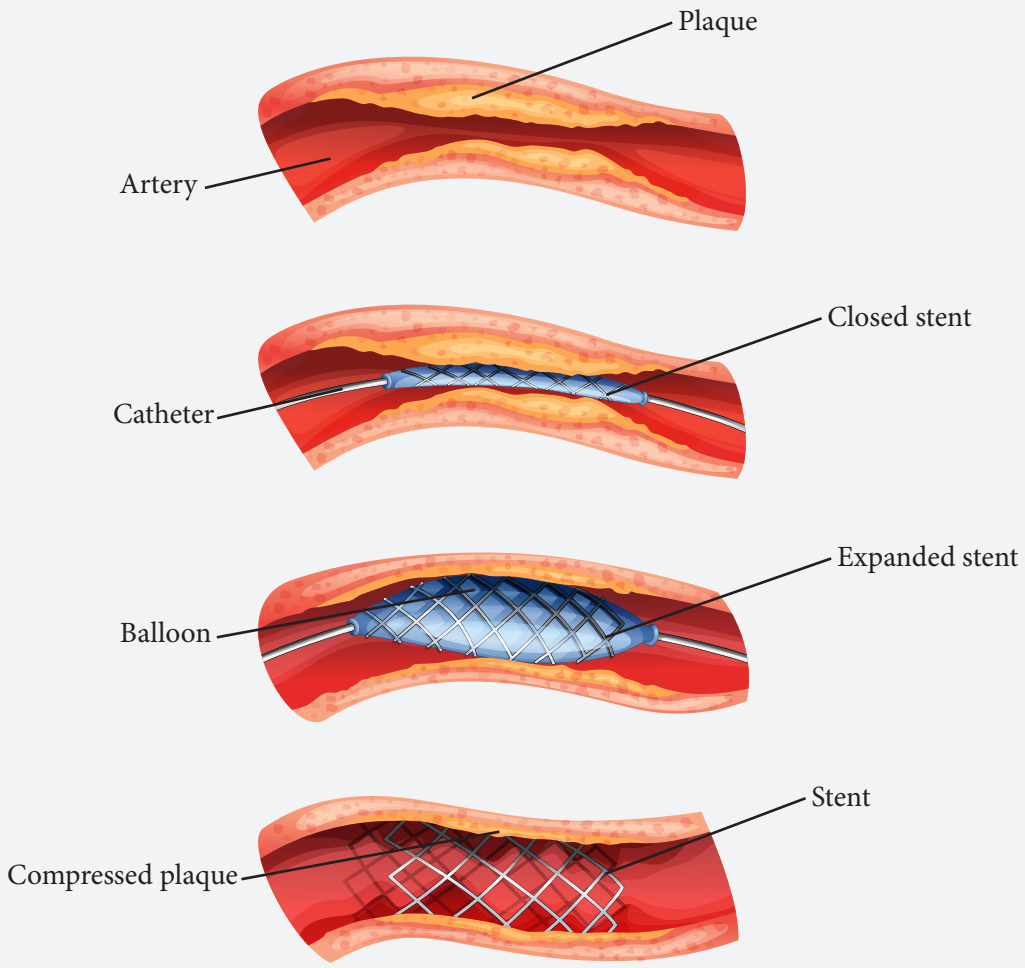
Coronary angioplasty, sometimes called PTCA or PCI, is a catheter-based procedure performed by an interventional cardiologist in order to open up a blocked coronary artery and restore blood flow to the heart muscle. Angioplasty now is used as an alternative treatment to coronary artery bypass surgery (CABG) more than half the time. It is less invasive, less expensive, and faster to perform, with the patient usually returning home the next day. In most cases, following balloon angioplasty, a stent will also be placed to keep the artery open. Angioplasty is performed on an elective basis to treat symptoms of coronary artery disease, such as angina that is not controlled with medication, but it is also performed on an emergency basis to treat a heart attack. It is, in fact, the "gold standard' for the treatment of an acute ST-Elevated Myocardial Infarction (STEMI).[95]

The procedure works by placing a tube into the heart and inflating a balloon in the blocked artery, most commonly a wire mesh stent is then left in place to keep the artery open and the blood flowing.
NICE recommends that PCI is used to manage stable angina and acute coronary syndromes in three ways:

- Alleviate the symptoms of angina
- Restore coronary blood flow during a heart attack (primary PCI)
- Prevent future myocardial infarction[96]

93 http://www.ssehsactive.org.uk/userfiles/Documents/coronary-heart-disease-stats2010economics.pdf
94 http://heart.bmj.com/content/88/6/597
95 http://www.angioplasty.org/nv/angio101.html
96 https://www.nice.org.uk/guidance/cg126/chapter/guidance#investigation-and-revascularisation

The PCI Procedure



The savings

The UK carried out 96,143 PCI procedures in 2015.[97] Data shows that 36% of those people undergoing PCI will be under the age of 60.[98] Studies have also shown that 93% of people who were in work, will return to work after a PCI.[99] That equals 32,456 patients who are in work today that otherwise would not be. Job Seekers Allowance is currently £3,801 per person per annum. **This means PCI is currently saving £121.5m per year**, every year for the rest of patients working lives.

97 http://www.ucl.ac.uk/nicor/audits/adultpercutaneous/documents/2014-annual-report.pdf
98 https://www.ucl.ac.uk/nicor/audits/adultpercutaneous/documents/2013_annual_report_pdf
99 http://openheart.bmj.com/content/openhrt/3/1/e000322.full.pdf

Conclusion

Changing NHS practices and cultures will take time and investment. Doing things differently and delivering healthcare more efficiently will require better use of technology to ensure that the NHS gets the maximum benefits from all the inputs.

Looking at just 8 technologies the MTG has been able to find evidence that supports savings of up to £476.5 million to the UK government. These savings might not be realised within healthcare settings, many will come in the form of reduction in benefits payments for the unwell.

If this money were put back into the NHS it would cover an extra:

- 20,000 nurses[100]
- 4,000 consultants[101]
- 8,500 GPs[102]
- 10.5 million GP visits[103]

Better use of technology will not only mean savings for the Government, it will also benefit patients who can get their independence back and lead full and active lives. Technology can allow people to return to work and make a full economic contribution.

For families and carers, technology can relieve some of the burden of looking after a sick relative. This can allow relatives of family members to make a full contribution to society and not be limited in their daily activity.

100 https://www.payscale.com/research/UK/Job=Staff_Nurse/Salary
101 http://www.telegraph.co.uk/news/2016/09/23/revealed-8000-hospital-consultants-paid-more-than-the-prime-mini/
102 http://www.payscale.com/research/UK/Job=General_Practitioner/Salary
103 http://www.itv.com/news/update/2014-05-22/one-visit-to-gp-costs-45/

Call to Action:

A. Improving data on medical technology use and effectiveness

1. With currently available data it can be difficult to measure the return on investment in medical technology. The MTG has identified a number of factors that should be taken into account by NICE and the Department of Health in setting strategic investment priorities. Better data collection and availability will allow for more informed assessments of the costs and benefits associated with the effective use of innovative medical technologies. Reliable measures of quality outcomes and long-term effects would be required to conduct accurate estimations of the impact of medical technologies on the economy and the labour market.

2. The Department of Health and NHS England should conduct research to monitor and evaluate the adoption, clinical, cost-effectiveness, and labour market outcomes of wider adoption of medical technologies – including international comparisons. The results of this work should inform clinical guidelines, care pathways and early intervention strategies, especially in the domain of long-term conditions.

3. The Department of Health should make more explicit provision within the NHS Outcomes Framework to evaluate clinical and labour market outcomes in relation to the use of medical technologies to inform innovative best practice.

B. Enhance education about medical technologies

1. Both patients and healthcare professionals need to improve their awareness of currently available and innovative medical technologies. Raising patient awareness and their confidence in making healthcare choices would take into account quality of life and labour market outcomes on par with clinical effects of technologies. The Department of Health and NHS England should work in partnership with patients, industry and commissioners to develop guidance which increases patient awareness and choice over treatment, therapies and medical devices.

2. The Department of Health and NHS England should appoint expert users of a range of medical devices (including those of working age) to be part of and advise the national Healthwatch body.

3. The NHS must invest in the education of medical professionals to challenge conservative approaches to innovation and to introduce incentives for the wider acceptance of medical advancements and their use, where appropriate, as part of earlier interventions to improve quality of life and labour market participation. Trainee and practicing doctors should be provided with education and training on the features and benefits of medical devices which are cited in NICE or other professional guidance. This would enable them to support patients through treatment and at the same time learn from the experiences of intervention users, especially if the technology has wider quality of life or labour market benefits.

C. Recognise the long-term benefits of medical technologies

1. For many medical technologies, health professionals and commissioners appear resistant to use them because of the high upfront costs associated with the uptake. However, the long-term benefits of improved health outcomes, quality and length of life, and participation at work and in wider society should also be considered. Where possible, NICE should be free to comment on the wider societal benefits of medical technologies as part of its technology appraisal process.

2. At the very least, NICE quality standards should highlight the appropriate use of medical devices and aim to achieve the recommended uptake where it has previously been outlined in NICE guidance.

3. In the interest of the wider economy and society, uptake of cost-effective, efficacious and beneficial medical technologies could provide long-term savings and benefits through improved health outcomes, NHS efficiency and participation in society. Consideration could be given to some type of systemic modification that rewards long-term decision-making or incorporates improved long-term health care and quality of labour market outcomes in the budgeting calculus at the local level.[104]

104 http://www.mtg.org.uk/wp-content/uploads/2017/01/Adding-Value-The-Economic-and-Societal-Benefits-of-Medical-Technology.pdf

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