CADTH

2017

HORIZON SCAN ROUNDUP

Part 1

A Compilation of New and Emerging Health Technologies From Around the World

CADTH

About CADTH: CADTH is an independent, not-for-profit organization responsible for providing Canada's health care decision-makers with objective evidence to help make informed decisions about the optimal use of drugs, medical devices, diagnostics, and procedures in our health care system.

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The King's Fund (UK)

McGill-TAU
Technology Assessment Unit of the McGill University Health Centre (Canada)

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NICE
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2017 Horizon Scan Roundup

CADTH's Horizon Scanning service identifies and monitors new and emerging health technologies likely to have a significant impact on health care in Canada. The service systematically scans and monitors health information resources to identify promising health technologies not yet in wide use in the Canadian health care system. It then provides summaries of current information about the use, effectiveness, cost, and implementation of these technologies, which it publishes regularly in bulletins and newsletters.

Part of CADTH's horizon scanning process involves monitoring what other international horizon scanning agencies and services have been tracking and evaluating for their own jurisdictions. The resulting "roundup" is a compilation of 66 titles issued in late 2016 and the first six months of 2017 by 12 major international horizon scanning services and selected health organizations recognized for their identification of innovative technologies. The materials have been organized into the medical specialty categories used to categorize CADTH's own reports. The focus of this roundup is restricted to non-drug medical technologies including medical devices, laboratory tests, biomarkers, programs, and procedures. For more information about the horizon scanning agencies whose work is included in this report, please visit their websites.

These horizon scanning reports were last reviewed on July 7, 2017.

Cancer, Imaging, and Radiology

Ablative techniques for the treatment of localised prostate cancer (update)
HealthPACT

Focal ablative treatments (those that destroy abnormal tissue) for prostate cancer use extreme cold, heat, or electrical energy to ablate tissue. These treatments include cryotherapy (or extreme freezing), irreversible electroporation (which uses an electric current to help transport substances to the cells), MRI-guided focal laser ablation, and radiofrequency ablation. Ablative treatments may be alternatives to radical prostatectomy — the surgical removal of the entire prostate gland — for some patients, and they may have less risk for complications such as urinary and fecal incontinence, and erectile dysfunction, associated with radical prostatectomy.

Bindex for investigating suspected osteoporosis
NICE

Bindex is a portable, pocket-sized ultrasound device and computer software program. It is intended to be used, alongside an assessment of other risk factors, to diagnose osteoporosis or fracture risk based on the density of the tibia, or shin bone, rather than the heel. Bindex may be an alternative to testing with dual-energy X-ray absorptiometry (DXA) for patients deemed at high risk for osteoporosis and, because it is portable, it is suitable for use in community settings. Bindex testing is less expensive than DXA if it is administered by a trained health care provider, such as a nurse rather than a physician, and is used instead of DXA. Unlike DXA, it does not expose the patient to radiation.

Proton and heavy ion therapy: an overview
HealthPACT

Proton beam therapy is a form of radiotherapy for certain types of cancer that uses protons rather than photons. It has been used since the 1950s. The use of heavy ions (e.g., carbon, oxygen, and fluorine) has been introduced recently but this is still considered experimental. Internationally, the use of proton beam therapy has grown rapidly. Most facilities are in the US, Japan, China, and Europe; Canada has one facility. Expanded clinical indications for proton beam therapy are being assessed. The installation, operating, and maintenance costs of these facilities are considerable.

SimpliCT laser-guided needle placement in interventional radiology
NICE

SimpliCT uses a laser to guide non-vascular needle punctures during procedures that use computed tomography. It is designed to help position the needle with fewer manipulations, which could reduce fluoroscopy time, thereby reducing radiation exposure to both operator and patient; and reduce the number of needle sticks, thereby reducing patient discomfort.

STAR tumor ablation system (update)
HealthPACT

STAR uses targeted radiofrequency ablation (t-RFA) to relieve pain caused by spinal metastases. The system allows an interventional radiologist to perform the treatment, along with vertebral augmentation with bone cement, to repair fractured or weakened vertebra. It can also be used for tissue biopsies.

Cardiovascular

Bioresorbable vascular scaffolds for coronary artery disease (update)

HealthPACT

This update expands on the original brief published in 2015 with the addition of new evidence. Stents are small tubular devices that are installed to address narrowing of the arteries in cardiovascular disease. Bioresorbable vascular scaffolds are stents that dissolve over several years and are an alternative to permanent bare metal or drug-eluting stents. Their potential advantage over permanent stents lies in the reduction of vascular adverse events, reduction in imaging contraindications, and eligibility for further vascular treatment. The technology is currently approved for use in Canada.

CentriMag for heart failure

NICE

Ventricular assistive devices (VADs) may provide more time and better quality of life for patients awaiting heart transplants or other long-term solutions for heart failure. They support the heart by taking over the pumping function of the ventricles. CentriMag includes an external battery-operated controller, pump, and attachments that are surgically installed through the abdomen; it is also available for pediatrics as PediVas. CentriMag can be used for longer periods than other VADs on the market but at additional cost to standard of care.

ER-REBOA catheter for resuscitative endovascular balloon occlusion of the aorta (REBOA)

HealthPACT

REBOA stands for "resuscitative endovascular balloon occlusion of the aorta." This procedure involves temporarily blocking the aorta and blood flow to the lower limbs with a catheter-guided balloon. The aim is to restore blood flow to vital organs during serious cardiac events and trauma involving blood loss, buying time for more permanent solutions. The ER-REBOA catheter was designed in response to the current practice of using equipment not designed for REBOA, in the interest of improved safety, convenience, and ease of use.

High-cost assistive technologies in critical care

HealthPACT

This review focuses on extracorporeal (which occurs outside the body) membrane oxygenation (ECMO) for adult patients, neonates (newborns), and children with acute respiratory distress or heart failure. ECMO can be an additional treatment or a substitute for other interventions; for example, mechanical ventilation or as a bridge to heart or lung transplantation. The review includes ventricular assist devices and a scan of other new and emerging critical care technologies, including the Haemolung RAS (respiratory assist system), CircuLite Synergy pump, C-Pulse, and total artificial heart technologies, such as CardioWest and BiVACOR.

Magnetically-enhanced diffusion system for acute ischaemic stroke

NIHR-IO

In ischemic stroke, where blood flow has been cut off from the brain, timely drug delivery is critical to resolving blood clots. The Magnetically-Enhanced Diffusion (MED) System uses an external magnetic field delivered by a workstation placed near the head of the patient to control intravenously injected iron-oxide microbeads. Manipulation of the beads mixes the blood to improve drug diffusion and dissolution of the clot. Faster dispersion of the clot could potentially improve patient outcomes.

Mobile stroke units for prehospital care of ischemic stroke

CADTH

Early diagnosis and treatment are essential for avoiding harms associated with stroke. Mobile stroke units are medical vehicles equipped with diagnostic imaging equipment and staff trained to provide diagnosis and treatment for stroke at point of care. This type of care delivery may reduce time to treatment, particularly where access is challenging, such as in rural and remote areas.

Rapid compendium on heart failure technologies

HealthPACT

Heart failure (HF) occurs when structural or other dysfunction of the heart leads to impaired pumping and relaxation, resulting in poor blood flow throughout the body (insufficient ejection fraction). This report summarizes information regarding six technologies for use in HF. The included technologies aim to support the functioning of impaired heart tissue through various means. Intracoronary gene transfer (using adenovirus vector) and mesenchymal stem cell therapy (MSCT) for advanced HF work to regenerate proteins and tissues essential to heart function. The Edema Guard Monitor and the CardioMEMS HR System help to guide treatment decisions by monitoring fluid and blood pressure in the lungs, respectively. And to support restoration of pumping and optimize blood flow, left ventricular parachute devices (for ischemic HF) and interatrial shunt devices (for chronic HF) with preserved left ventricular ejection fraction alter the heart structure and geometry.

Use of extracorporeal membrane oxygenation for cardiac life support in adult subjects

McGill-TAU

Extracorporeal membrane oxygenation (ECMO) is a temporary life-support technology based on a modified form of cardiopulmonary bypass system. It is used for patients with acute respiratory or heart failure, and may be an alternative to ventricular assist devices, cardiopulmonary bypass, and mechanical ventilation. The technology is resource-intensive and it requires a multidisciplinary ECMO team (including cardiovascular, intensive care, and perfusionist expertise) to determine which patients might benefit and to facilitate access to this treatment.

Wireless technology for left ventricular pacing without coronary sinus
HealthPACT

For some patients with cardiac arrhythmias, or irregular heart beat, traditional pacemakers may fall short. The Wireless Stimulation Endocardially (WiSE) cardiac resynchronization therapy system is proposed as a less invasive alternative to traditional biventricular pacing. A small receiver is implanted inside the left ventricle and controlled through an ultrasound system that synchronizes with the existing pacemaker. Stimulation by the receiver enhances pacing of the left ventricle for more effective resynchronization.

Zio service for detecting cardiac arrhythmias
NICE

Cardiac arrhythmias — irregular heartbeat associated with cardiovascular complications — are usually detected using short-term Holter monitoring or event recording. Both methods have drawbacks including the inconvenience of the equipment and events missed (not captured). The Zio Service is a remote cardiac monitoring program that uses a recording device (the Zio Patch) and machine-learned algorithms to produce reports on cardiac arrhythmias for clinician review. The leadless patch is attached to the chest for up to 14 days, rather than the typical 24-hour observation period, which may help detect a greater number of arrhythmias. Zio costs more than conventional monitoring methods; other similar devices are in development.

Dermatology, Wounds, and Injuries

TopClosure tension relief system for wound closure
NICE

The TopClosure Tension Relief System stretches the skin to improve wound closure and healing using two techniques: stress-relaxation and mechanical creep. It may be an alternative to skin grafts, skin flaps, or tissue expanders for larger wounds, such as those from injury, amputation, or tumour removal. TopClosure is designed to apply less tension to the skin compared with standard procedures for wound closure, thereby improving wound closure and the appearance of the resulting scar.

Ear, Nose, and Throat

New and emerging technologies for hearing loss
NIHR-IO

This review identifies 55 new and emerging technologies that may help with the management of hearing loss. These include education and training programs, assistive devices that work with mobile phones, hearing aids, implants, surgical procedures, and a regenerative medicine intervention intended to regrow sensory hair cells in the inner ear.

Endocrine, Nutrition, and Metabolic

Flash glucose monitoring system for diabetes

CADTH

For people with diabetes, monitoring blood sugar levels involves frequent finger stick tests or a continuous glucose monitor to ensure their levels remain within an acceptable range. A new device, the FreeStyle Libre Pro, is intended to replace the need for finger stick tests by using a sensor implanted into the arm, which is read by an external scanner to provide health care providers with a record of glucose levels, trends, and patterns.

A hybrid closed-loop insulin delivery system for the treatment of type 1 diabetes

CADTH

Wearable systems to help people with type 1 diabetes control their blood sugar or to deliver insulin doses throughout the day are currently available. The MiniMed 670G connects these two systems wirelessly using a computer program to automatically adjust insulin levels throughout the day. While users must still manually dose insulin at meal times, the system may help improve the quality of life of people with type 1 diabetes.

Islet cell replacement therapy for insulin-dependent diabetes

CADTH

Islet cells in the pancreas are responsible for producing insulin the body uses to control blood sugar. In some people with diabetes, the body has destroyed islet cells or the cells cannot produce enough insulin. Using stem cells, ViaCyte is currently developing a line of laboratory-grown islet cells that may serve as a functional cure for people living with insulin-dependent diabetes.

MiniMed 670G hybrid closed loop system for type 1 diabetes

NIHR-IO

The MiniMed 670G is an automated system that checks blood glucose levels and administers the appropriate dose of insulin in people with type 1 diabetes. The system operates throughout the day and night, possibly reducing episodes of hypoglycemia and hyperglycemia, and reducing the number of insulin injections needed. Consequently, it may improve quality of life for people with type 1 diabetes.

Point-of-care glycated hemoglobin testing to diagnose type 2 diabetes

CADTH

Glycated hemoglobin (A1C) is the marker used to monitor blood sugar control in people with diabetes. Although many point-of-care A1C tests are approved for monitoring blood sugar control, the Afinion HbA1c Dx system is the first to seek approval for the diagnosis of type 2 diabetes. Point-of-care A1C testing may help clinicians expedite care, and be a more convenient option for people with suspected type 2 diabetes.

Prevention of plantar ulcers in people with diabetic peripheral neuropathy using pressure-sensing shoe insoles
CADTH

Over time, damage to the nerves serving the feet causes loss of pain and temperature sensation, which puts people with diabetes at risk of developing sores or wounds caused by prolonged pressure or injury. The SurroSense Rx system is a set of shoe insoles that monitors pressure distribution between the foot and the surface supporting it. It sends real-time alerts to a proprietary smartwatch should pressures over time put tissue at risk. Intended for use in addition to current prevention strategies, the system may help users adjust their behaviours to prevent injuring the foot.

A transdermal glucagon patch for severe hypoglycemia
CADTH

Very low blood sugar can cause loss of consciousness, seizures, or coma. In an emergency, glucagon is used to quickly raise blood sugar levels, but preparing it for injection requires multiple steps and often the assistance of another person. The ZP-Glucagon Patch uses microneedles to deliver glucagon through the skin into the fluid surrounding the cells below. Still in the early stages of human testing, the patch may be a more user-friendly option for glucagon delivery.

Eye and Vision

Boston Keratoprosthesis Type I for corneal blindness
NICE

The Boston Keratoprosthesis Type I is an artificial cornea intended for people with corneal blindness for whom a corneal transplant is not possible or has previously failed. Unlike other similar prostheses, the device does not need to be specifically designed for each individual patient — which means that it can be more easily replaced should the need arise.

Gastroenterology and Liver

NaviCam for diagnosing gastrointestinal tract conditions
NICE

NaviCam is a capsule endoscopy system used to diagnose conditions in the upper gastrointestinal tract and small bowel. Unlike other capsule endoscopy technologies, NaviCam allows the endoscopist to control the location of the capsule (via magnets) for better visualization of the area in question. NaviCam is less invasive than gastroscopy, as it does not require sedation or intubation, and patients prefer it to gastroscopy.

Permacol for treating anal fistulae
NICE

Permacol is a collagen paste made from pig skin that has been developed to treat anal fistulae. It is injected into the fistula, where it expands to fill and seal the fistula tract. Permacol may be less likely to be expelled than conventional collagen plugs, and it might offer a less invasive alternative to fistulotomy surgery that could improve quality of life and relieve pain in patients with this condition.

RIDASCREEN tests for monitoring infliximab in inflammatory bowel disease
NICE

RIDASCREEN IFX Monitoring and Anti-IFX Antibodies are tests used to measure infliximab levels in the body, or antibodies to infliximab (or biosimilars) in the blood or plasma, of patients receiving treatment for inflammatory bowel disease such as ulcerative colitis or Crohn disease. Testing would be an add-on to current practice, and is intended to guide drug dosage — ideally, to optimize dosage; the resulting savings in drug costs and reduced hospitalization might offset the additional costs of testing. Similar tests are already commercially available.

VAAFT for treating anal fistulae
NICE

Video-assisted anal fistulae treatment (VAAFT) allows treatment of anal fistula using diathermy — electrical energy — as an alternative to surgical drainage and removal of the fistula in a procedure called a fistulotomy. The VAAFT kit includes a video camera called a fistuloscope for identification of the fistulae and visual guidance during the procedure, a unipolar electrode that connects to a high-frequency generator for the diathermy treatment, and a fistula brush and forceps to clean the tract. VAAFT may reduce the need for MRI scans and further costs associated with post-surgical wound dressings required for several months after open fistula surgery. It may also reduce the risk of fecal incontinence following fistula surgery.

Gynecology and Obstetrics

Fractional CO2 laser treatment of vulvovaginal atrophy
HealthPACT

Laser treatment of vaginal atrophy is being marketed to post-menopausal women or women who have undergone cancer treatments that cause surgical menopause. The procedure involves three laser treatments at four- to six-week intervals, and an additional treatment annually or if symptoms recur. Several manufacturers have commercially available CO2 lasers, including the MonaLisa Touch, FemTouch, and FemiLift. It may be may be an alternative to, or used in conjunction with, systemic or topical hormone replacement therapy or non-hormonal vaginal lubricants.

Infectious Disease and Infection Control

eazyplex SuperBug kits for detecting carbapenemase-producing organisms
NICE

The eazyplex SuperBug kits are ready-to-use test strips for detecting the presence of carbapenemase-producing organisms and extended-spectrum beta-lactamase genes in rectal swap samples, which would indicate antibiotic resistance. Able to provide test results in less than 30 minutes, these technologies are intended to replace standard lab testing; however, positive samples would still need to be grown in the lab to determine what antibiotics the organisms are resistant to. The kits must be used with OptiGene's Genie II, an instrument used for the rapid identification of bacteria and viruses using DNA and ribonucleic acid (RNA) amplification.

MALDI-TOF for detection of antibiotic resistant bacteria
HealthPACT

Matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF) is used to identify bacteria, yeasts, and fungi by shining a laser on the microorganisms and producing a "fingerprint" unique to an ion pattern that can then be compared to patterns of known pathogens. An emerging use of the technology, currently in the early stages of study, is for identifying antibiotic-resistant bacteria such as vancomycin-resistant enterococci.

Rapid sepsis detection
HealthPACT

Currently, the diagnosis and treatment of sepsis — a serious, life-threatening complication of infection — takes several days and may be unreliable. Two emerging technologies to rapidly diagnose sepsis, T2Candida and IRIDICA, analyze patient blood samples to detect the microorganisms that may cause sepsis, and have the potential to improve patient outcomes and reduce the inappropriate use of antibiotics.

Kidney and Urology

Endovascular arteriovenous fistula creation systems
HealthPACT

Arteriovenous fistulae, abnormal connections between an artery and a vein, are surgically created to provide vascular access in people who need hemodialysis for end-stage renal disease. However, new less invasive devices provide endovascular access without requiring an open surgical procedure to create the fistula. These devices may reduce pain, infection, and hospitalization rates for select patients, and may improve access for patients waiting for fistula creation.

U-Drain for people needing night drainage of urine or dialysis fluid
NICE

The U-Drain has been developed for people who need overnight drainage of a urinary catheter or urostomy pouch, or for people on automated peritoneal dialysis who need drainage of urine or dialysis fluid. Intended for home or residential care use, the system is permanently installed and connected to the building's main drainage system. It is an alternative to using a night drainage bag to capture these fluids.

Wearable artificial kidneys for end-stage kidney disease
CADTH

Other than a kidney transplant, dialysis is the main treatment option for people with end-stage kidney disease. For several years, researchers have attempted to develop a wearable artificial kidney, but technical issues with these devices remain to be resolved. The technology requires further development and commercial availability is still several years away.

Mental Health

Mental health and new models of care

The King's Fund

Artificial barriers and boundaries to mental health care lead to poor patient outcomes and increased pressures on, and costs to, the health care system. This report discusses integrated models of care such as primary care homes and multispecialty care providers serving communities of 30,000 to 50,000 people, and the coordination of urgent and emergency care services. These new care models are being developed and tested at 50 sites across England.

Monarch external trigeminal nerve stimulation (eTNS) system for attention deficit hyperactive disorder (ADHD)

NIHR-IO

The Monarch eTNS System has been designed to treat attention-deficit/hyperactivity disorder (ADHD) by stimulating the trigeminal nerve, which is responsible for face movements and sensations. It uses an adhesive electrode patch applied to the forehead and connected to an external generator to deliver pulses of electrical energy to this nerve, which connects to areas of the brain associated with ADHD. The non-invasive device is intended for use at home, overnight, and may help improve behavioural symptoms of ADHD without the side effects associated with medications.

Transcranial magnetic resonance-guided focused ultrasound and deep brain stimulation for refractory depression

HealthPACT

This report discusses two interventions for treating refractory depression — depression that does not respond to standard medical or psychological treatments. Transcranial magnetic resonance-guided focused ultrasound is currently in the early stages of human testing, with trials currently underway. It works by targeting areas of the brain associated with depression and ablates them using quick temperature elevations (no human studies of this intervention were found in the published literature). Deep brain stimulation connects an electrode implanted into the brain to an electrical pulse generator implanted into the chest wall. The electrode provides continuous stimulation to parts of the brain associated with mood.

Nervous System and Neurology

Emerging technologies for the diagnosis, treatment and management of epilepsy

NIHR-IO

This review identified 114 new and emerging technologies for epilepsy, including 87 medical devices and other interventions. Notably, included are perspectives on these new technologies from clinical experts and people affected by epilepsy.

gammaCore for the treatment of medically unexplained symptoms

NIHR-IO

The gammaCore is a form of non-invasive, self-administered vagus nerve stimulation. The small, portable device is held against the skin on the side of the neck for two minutes of stimulation, two to three times per day. It is intended to treat patients with symptoms such as pain, headache, anxiety, depression, and gastric motility (or contraction) disorders that cannot be linked to physical causes. For some patients, it may be an alternative to various drug treatments for these conditions.

Monarch external trigeminal nerve stimulation system for drug-refractory epilepsy

HealthPACT

The Monarch device is a non-invasive treatment for drug-resistant epilepsy. A patch applied to the forehead is used to deliver a low-intensity electrical current from a small stimulator the size of a large cell phone to stimulate the trigeminal nerve responsible for face sensations and motor functions. Monarch could potentially be an alternative to invasive brain surgery or treatment with vagus nerve stimulation.

Neuronaute smart clothing for the diagnosis and monitoring of epilepsy

NIHR-IO

This wearable technology, a shirt and cap containing biometric sensors, intended for home use, monitors physiological changes that signal a seizure in people with epilepsy. Data from the system is sent to clinicians or caregivers via a smartphone app. This data may ultimately help to diagnose epilepsy and detect variations in physiological changes caused by different types of epilepsy, including unexpected death during sleep.

Portable neuromodulation stimulator for multiple sclerosis

NIHR-IO

The Portable Neuromodulation Stimulator (PoNS) provides painless electrical impulses to the tongue to help improve balance and walking in people with advanced multiple sclerosis. This is combined with exercise and other rehabilitative interventions as part of cranial nerve non-invasive neuromodulation therapy, which is intended to develop neuroplasticity, or the ability of non-damaged areas of the brain to be retrained and take over the functions of damaged areas.

Portable neuromodulation stimulator for traumatic brain injury

NIHR-IO

Another use of the PoNS device is as part of functional rehabilitation therapy — cranial nerve non-invasive neuromodulation — in people who have experienced a mild to moderate traumatic brain injury. As described in the previous item, the device delivers electrical impulses to the tongue to stimulate the trigeminal and facial nerves that provide signals to the brain. When combined with other rehabilitation interventions, the PoNS may improve balance and brain neuroplasticity.

SecurAcath for securing cerebrospinal fluid catheters
NICE

SecurAcath is a single-use device with a small metal "anchor" that is inserted under the skin to hold a cerebrospinal fluid drainage catheter in place, thus preventing accidental dislodgement or removal. These catheters are used to drain cerebrospinal fluid and reduce pressure on the brain in children and adults with hydrocephalus, or cerebrospinal fluid buildup. Current methods for securing the catheters include sutures and adhesive tape. SecurAcath may reduce the risk of infection and pain associated with insertion or revision insertion and the use of these catheters. Other SecurAcath devices are available for securing different types of catheters; for example, venous catheters.

StimQ peripheral nerve stimulator system for the relief of severe difficult to manage persistent pain
ISCRR

StimQ is a small, implantable device that uses electrical pulses to stimulate peripheral nerves (those outside of the brain and spinal cord) to relieve severe chronic pain in the limbs and body but not in the head or neck. The wireless system is intended disrupt the transmission of pain signals to the brain. It can be used in addition or as an alternative to other pain treatments, such as opioids.

Orthopedics

Barricaid prosthesis for partial annulus replacement (update)
HealthPACT

Barricaid is a small, polymer fibre mesh that is inserted into the space created when a herniated spinal disc is removed in a discectomy. Only certain patients with herniated discs (e.g., those with larger defects that are more prone to re-herniation after surgery) might benefit from this add-on to conventional discectomy.

Neo pedicle screw system for spinal fusion surgery
NICE

This single-use set of instruments, screws, and rods is for use in spinal fusion surgery for treating back or leg pain in adults. The system has fewer components and requires less storage space than conventional single-use and reusable pedicle screw (type of bone screw) instrument sets. The smaller set of components and the single-use features of the technology may make the surgical procedure easier to perform and reduce sterilization costs.

OnSight 3D Extremity System for assessing damage in limbs
NIHR-IO

OnSight uses a cone beam computed tomography (CBCT) scanner to generate 2-D and 3-D X-ray images of the arms and legs to aid in diagnosing bone and soft tissue disorders of the extremities in adolescent and adult patients. Scans can be taken while the patient is standing, potentially allowing better detection of tiny fractures in the knee, ankle, or bones of the foot. Two other CBCT systems for imaging the arms and legs are also commercially available.

Outpatient (same-day) total hip replacement
CADTH

Outpatient hip replacement requires a multidisciplinary team approach that includes careful patient selection, patient education, improved anesthesia and analgesia, advanced surgical techniques to minimize muscle damage and blood loss, early mobilization, intensive physical therapy, and the active involvement of caregivers at home. For selected patients, same-day hip replacement can improve patient quality of life and functioning after hip replacement, and reduce health care costs through shorter hospital stays.

Rehabilitation

Ekso exoskeleton for rehabilitation in people with neurological weakness or paralysis
NICE

The Ekso GT robotic exoskeleton is designed to be used as part of a rehabilitation program for people with weak or partially paralyzed legs due to spinal cord injury, stroke, or other neurological conditions. To use the system safely, users must have enough arm strength to use crutches or a walker. The SmartAssist software for the exoskeleton allows the physiotherapist to customize and save different gait settings for each leg and for use by multiple patients. It is intended to be used instead of or alongside conventional rehabilitation techniques.

Mollii suit for spasticity
NICE

The Mollii suit (formerly called the Elektrodress) is a wearable technology (coat and pants) that administers transcutaneous electrical stimulation (TENS) to the entire body via 58 electrodes. This is unlike conventional TENS applications, which focus on a particular part of the body. It is intended as an additional therapy to drug and rehabilitative therapies for people with muscle spasticity (when muscles are tight and contracted), such as those with cerebral palsy or for stroke patients. The suit is worn for 60 to 90 minutes every other day and is reported to improve spasticity and movement for up to 48 hours after use, or possibly longer after regular use.

Spinal cord stimulation to improve function following spinal cord injury
ISCRR

Neurostimulation (also called neuromodulation) of the spine uses electrical stimulation of the nerves of the spinal cord in conjunction with intensive rehabilitation therapies to help restore function in people with severe spinal cord injury. The stimulation can be from epidural, implanted devices, or from transcutaneous devices that are applied to the skin (as with the NeuroRecovery Technologies spinal cord stimulation systems). These technologies could potentially be used in outpatient rehabilitation and in home care.

Therapeutic hypothermia for intracranial hypertension following traumatic brain injury

HealthPACT

Therapeutic hypothermia — the rapid cooling of the brain using various techniques, including ice packs, intranasal hypothermia, and cooling caps — is intended to reduce neurological damage following traumatic brain injury. It has been used as an alternative to conventional treatments such as with oxygen, diuretics, coma-inducing medications, neuromuscular paralysis-inducing medications, and the drainage of cerebrospinal fluid.

Respiratory

Endobronchial valves for patients with advanced heterogeneous emphysema (update)

HealthPACT

Emphysema is a type of chronic obstructive pulmonary disease where the air sacs in the lungs become damaged, making it difficult to breathe. Endobronchial valves can be placed into diseased parts of the lungs, allowing air to exit but not enter. This procedure causes the diseased areas to become smaller, thereby allowing healthy lung tissue to expand, which may improve breathing. This update to a 2015 report highlights new evidence for two valves marketed under the brand names Spiration Valve System by Olympus, and the Zephyr Endobronchial Valve by PulmonX.

Nyxoah Genio System for obstructive sleep apnea

NIHR-IO

The Nyxoah Genio System is a small neurostimulation device implanted under the chin. It is intended for use in people with moderate or severe obstructive sleep apnea, who are unable to use continuous positive airway pressure therapy. The device is activated at night using a disposable patch. When in use, electrodes stimulate both branches of the hypoglossal nerve, causing the tongue to contract and therefore keeping the airway open. This method of neurostimulation may be more effective compared with other treatment options.

Smart One for measuring lung function

NICE

Smart One is a portable spirometer — a device used to measure the function of the lungs. The device measures both peak expiratory flow (how fast air leaves the lungs when a person exhales as hard as possible after taking a full breath) and forced expiratory volume in one second (the amount of air that leaves the lungs during the first second of exhalation). The device includes a mobile app to track results, and reusable, washable parts. It is intended for use at home by one person, and may allow people with asthma, cystic fibrosis, or chronic obstructive pulmonary disease to take measurements and monitor their conditions during moments when symptoms suddenly worsen.

Smartinhaler for asthma
NICE

The Smartinhaler is a group of sensors inside a plastic case attached to an asthma inhaler. When the inhaler is used, the sensors record the date and time of activation. This information is then transmitted live to a cloud-based server or can be uploaded manually through a desktop computer application. A mobile app allows users to review inhaler use for the last seven or 28 days. Using the Smartinhaler may help improve adherence to asthma care.

Other

AQUABEAM aquablation system for benign prostate hyperplasia
NIHR-IO

The AQUABEAM system is used to treat benign prostatic hypertrophy, or BPH, in men. The system includes ultrasound imaging to guide its robotically controlled waterjet that removes excess prostate tissue. It is intended to treat urinary tract problems (such as frequent urination or bladder obstruction) caused by BPH. The AQUABEAM may be an alternative to drug treatments that reduce the size of the prostate or to conventional surgical methods, such as transurethral resection of the prostate. Surgical complications can include urinary incontinence, erectile dysfunction, and retrograde ejaculation (where the semen enters the bladder).

Bair Hugger for measuring core temperature during perioperative care
NICE

The Bair Hugger (formerly SpotOn) is a non-invasive device that measures core temperature in patients undergoing surgery to help prevent hypothermia. The device uses a sensor placed on the forehead. It is an alternative to more invasive core temperature monitoring such as core temperature probes that can be used only when patients are sedated or under anesthesia.

Hemosep for cell salvage
NICE

Hemosep is an ultrafiltration and hemoconcentration system that recovers a patient's blood during surgeries that can involve significant blood loss, such as cardiac surgery. It uses a filter, rather than centrifugation (a forceful spinning method), to separate the components of the blood and remove excess fluid before the blood cells and other components are returned to the patient. The remaining plasma is in a gel form that makes disposal easier than with blood centrifugation. Minimal training is needed to use the Hemosep system, unlike current cell salvage technologies. The use of Hemosep could reduce costs by decreasing the need for donor blood transfusions.

Regenerative medicine in the United Kingdom: clinical delivery
York-SATSU

Regenerative medicine products present particular challenges for health care systems. These include the regulatory and reimbursement mechanisms requirements (such as risk-sharing schemes); the need for new manufacturing, transportation, and storage arrangements (for example, for products with a short shelf-life); and administration concerns associated with using living cells, tissues, or gene-based material (autologous and allogeneic) to treat patients. This policy briefing summarizes the conclusions of the UK's REGenableMED project.

Trends and Forecasts

Cleveland Clinic Innovations — 2017 Top 10 Medical Innovations
Technologies included in the 2017 edition of the top 10 list include liquid biopsies to identify tumour DNA shed by cancerous cells circulating in the bloodstream, augmented reality glasses to provide real-time information during surgeries, self-screening tests for HPV infection, and bioabsorbable coronary stents made from natural materials that are eventually absorbed by the body.

ECRI Institute — 2017 Top 10 Hospital C-Suite Watch List
The Hospital C-Suite Watch List includes technologies, and technology use issues. This year's list includes blue-violet room lighting and portable UV light-disinfecting robots that may reduce health care-associated infections, a pilot protocol to help reduce the risk of complications and costs of abdominal surgery, and a robot designed to respond to emotions that could help manage human traffic in health care facilities.

The Medical Futurist — The Most Exciting Medical Technologies of 2017
Technology trends identified for 2017 include advances in diabetes care, such as the artificial pancreas; using artificial intelligence in radiology and oncology; genome editing using CRISPR, or clustered regularly interspaced short palindromic repeats; and using distinct characteristics of the voice to diagnose disease.

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