

PICTURE OF HEALTH

2010

A snapshot of HRB funded research

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FOREWORD

Making research count

The Picture of Health is all about the positive impacts and outcomes from HRB funded research.

And with more than 200 researchers in 10 hospitals and 10 third level institutions completing projects in 2009, this publication captures just some of the great achievements that flow from our investments in research.

In 2009, a total of 111 HRB grants were completed, resulting in: -

- Eight patents, and eight patent applications
- 18 new treatments and technologies emerging from the research
- 57 different types of new evidence for health policy and practice
- 45 PhDs
- 85 new clinical trials

The Picture of Health shows that health research can really make a difference by: -

- improving people's health
- developing new treatments and services
- transforming the way we deliver care
- creating the potential for new commercial ideas and developments

This edition explores and illustrates the progress that has been made during the last year across a number of themes including; creating new devices and therapies,



changing attitudes and behaviours around health, innovating healthcare policy and practice, promising discoveries and potential treatments. It also reviews progress in terms of developing capacity for research within the health system.

In 2009, the HRB published a new strategic business plan. We clearly stated that the HRB would create the right skills, conditions and capacity in the Irish health system to: -

- accelerate the translation of research discoveries into real benefits for patients and the public
- close the gap between research outcomes and their application in policy and practice.

The Picture of Health 2010 demonstrates that this work has already begun.

A handwritten signature in black ink that reads "Enda Connolly". The signature is written in a cursive, flowing style.

Enda Connolly
Chief Executive

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CREATING NEW DEVICES AND THERAPIES



NEW DEVICE TARGETS CANCER TUMOURS

Early stage colon, stomach and throat cancers could be treated directly using a new medical device that applies a brief electric pulse to the tumour.

HRB-funded researcher, Dr Declan Soden, from the Cork Cancer Research Centre in UCC, developed the Endoscopic Electroporation Device (EndoVe) and explains that it has tremendous potential to tackle tumours, reduce side-effects and improve patient quality of life.

“We designed the EndoVe to focus on gastro-intestinal cancers, particularly colorectal, where all procedures would be conducted in a simple outpatient (day case) colonoscopy type procedure,” he says.

“When using the device, chemotherapy drugs are absorbed only in the area treated by the electrical field. This means lower drug concentrations and potentially shorter stays in hospital, reducing costs significantly for the healthcare provider,” adds Dr Soden.

“It uses 90 per cent less of the chemotherapy drug, which means ease of treatment and minimal side effects for the patient.”

So far, testing and trials of the medical device have progressed well, notes Dr Soden.

“All our pre-clinical testing was highly successful, which meant we could get permission to conduct a trial to treat patients with rectal cancer using the EndoVe device,” he says.

“It’s still very early into the trial, but the results so far are extremely encouraging. They show that EndoVe is both safe and has the desired effect; but of equal importance the patient benefits in terms of minimum toxicity or side-effects.”

Impacts

- » New medical device.
- » Clinical trials underway.
- » Reduces treatment side effects for patients.

KILLING GERMS IN HEALTHCARE SETTINGS

Targeted pulses of UV light could be used to disinfect and sterilise medical instruments, devices and surfaces, and the approach is particularly effective at killing strains of MRSA, according to collaborative research from Athlone Institute of Technology (AIT) and National University of Ireland, Galway (NUIG).

The growing problem of hospital-acquired infections means there is an increased need to examine new approaches to sterilise and disinfect. And, while pulsed light has been used before to decontaminate food, packaging, air and water, this is the first time the technology is being applied and tested in the healthcare setting.

How does it work? New pulsed-power technologies allow targeted delivery of energy, and in this case the energy is in the form of UV light that can kill germs.

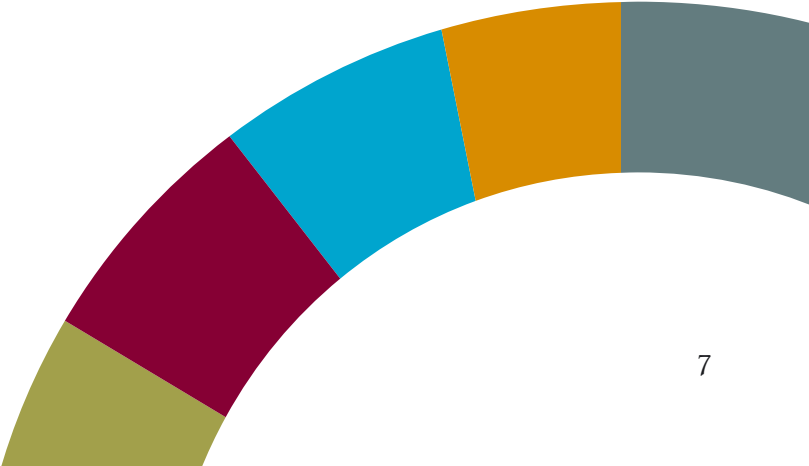
The AIT and NUIG researchers tested the response of a variety of germs, including MRSA, to pulsed-power technology under fixed conditions in the lab. This provided a good baseline against which they could see how the germs responded to pulsed light under different physical, chemical and biological conditions.

Their experiments with pulsed UV light showed a rapid and repeated reduction of all germs on contact surfaces and in the

air when compared with conventional disinfection methods. And the team went on to discover that once treated with the pulsed power, germs were not able to infect human cell lines.

This technique has major potential as a method of sterilisation and disinfection in clinical settings. Research team director, Dr Neil Rowan, states, "It could help to prevent infection which would impact positively on patient outcomes as well as reduce costs associated with the consequences of treating infection."

Impact
» New application of sterilising technology to reduce infection in healthcare settings.



MAKING TRAVEL SAFER FOR WHEELCHAIR OCCUPANTS

New research on the impact of a road traffic collision on wheelchair occupants shows that changes need to be made to wheelchair design to increase safety.

The research team at Trinity College Dublin, lead by Dr Ciaran Simms, also developed a wheelchair head restraint during their study that reduces the likelihood of whiplash in low impact, rear collisions.

In general, crash testing of road vehicles uses ‘dummies’ based on the average passenger: there is no consideration of disabled people who may not be of average shape and size, nor is it taken into account that they may be in adapted cars or wheelchairs.

To help gather more information, the team at Trinity developed and validated a crash-test computer model that could reflect different impact conditions experienced by people with disabilities.

Using the computer simulation, they found that someone with scoliosis, a condition in which a person’s spine is curved from side to side, in a wheelchair is at higher risk of sustaining injury in a crash.

They also demonstrated that special seat supports and correct positioning of wheelchairs could help reduce the risk of

injury in a crash, and they developed a head restraint for wheelchair users that reduced the likelihood of whiplash injury in low velocity rear impacts.

The research found that when plywood seats were fitted with the grain in the wood going back to front, the seat was more likely to break than if the grain went from right to left, and that the standard brackets used to secure the chair in position were not adequate.

The National Standards Authority of Ireland working group on wheelchairs and the Best Practice Guidelines group on wheelchair safety are now using the findings of this study to develop guidelines and practice.

Impacts

- » A new product under development with UK Safety Systems company that could help reduce injury of disabled people in crash situations.
- » New evidence to inform and develop national safety guidelines for disabled people in transit.

CHANGING ATTITUDES AND BEHAVIOURS AROUND HEALTH



EVALUATION OF AN ALCOHOL PROGRAMME IN A SPORTING SETTING: A CONTROLLED TRIAL

The Gaelic Athletic Association (GAA) has expressed concern about alcohol misuse among its members, and it set up a task force to examine the issue.

A HRB-funded study has also investigated the problem of sports and alcohol, with Trinity College Dublin and Health Service Executive (HSE) North East region working with the GAA to gather important data about the extent of alcohol misuse among players and how it relates to harm.

Players themselves reported high levels of consumption and alcohol-related harm, according to researcher, Dr Shane Allwright, from Trinity College Dublin.

“Although similar to levels of alcohol misuse and harm reported by sportsmen in New Zealand, the levels were higher than in men of similar age in the Irish general population,” she says.

“This suggests that there are potentially serious alcohol-related problems among the GAA player community, reflecting and amplifying the problems in the Irish population generally.”

The study also looked at the effects of a community-based intervention programme delivered by the HSE North East region to reduce alcohol-related harm among GAA

players. But they found that players at the 12 clubs that took part in the programme did not have better alcohol outcomes than players at the 27 clubs that did not participate.

However, over the course of the study, the researchers saw an overall decline in alcohol consumption among players, which they say is in line with trends in the general population.

According to Allwright, the findings point to the need for more effective ‘local’ interventions as well as policies that discourage drinking in the general population.

Impacts

- » Better understanding of alcohol misuse among GAA players.
- » Opportunity to engage with players and increase alcohol awareness.
- » Evidence of the need for more effective local interventions for alcohol misuse.

CHILDREN'S OBESITY LINKED TO MOTHERS

The indirect cost of obesity in Ireland is €400 million, and it's a problem that's not just affecting adults: one in five children in Ireland are now obese. This does not bode well for the nation's health, the health services or the economy.

New research on a group of children who have been monitored entering school at the age of five, called the Lifeways cohort, has provided for the first time a general health profile of this age group and highlighted that children as young as age five are obese.

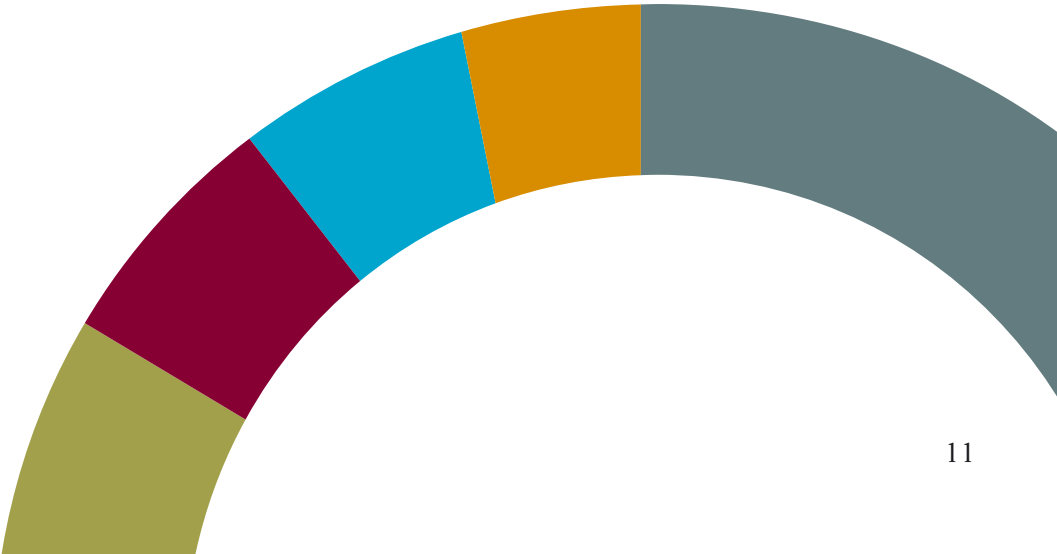
Analysis of the Lifeways evidence, by a team lead by Prof Cecily Kelleher at University College Dublin, has identified that in general a child's Body Mass Index (BMI) at the age of five relates to the mother's BMI. So the more overweight the child, the more likely the mother is to be overweight.

There is also a family pattern: looking at the reported BMI of all the other family members, mother, father, paternal and maternal grandparents, there is an obvious family influence along the maternal line.

The results closely reflect studies on animals which show that what a mother eats during pregnancy and what infants are fed are important factors in the risk of a child becoming overweight or obese.

While work remains to be done on tracing potential genetic reasons, there is evidence to underpin health messages that promote healthy eating habits among mothers, not only for themselves but also for the benefit of their children.

Impacts
» New link shown between obesity in children and their mothers.
» Evidence to drive public health messages.



ECSTASY AND CAFFEINE PROVE LETHAL COMBINATION

New research shows how ecstasy becomes even more toxic when taken with caffeine. Taken together, they impact the heart's ability to function, they alter body temperature and they increase the risk of death.

Dr Andrew Harkin, a HRB-funded researcher at Trinity College Dublin, discovered that a combination of ecstasy and caffeine provokes a variety of toxic responses in the body.

Caffeine and ecstasy work together to increase a chemical messenger called dopamine, and this has profound safety consequences when compared to consuming either drug alone.

"We have established that dopamine plays a key role in underpinning the toxic drug interaction between ecstasy and caffeine," says Dr Harkin. "Understanding these chemical interactions increases our understanding of how to treat toxic reactions in humans."

In a separate study, Dr Kathy O'Boyle at University College Dublin showed that combining low doses of caffeine and ecstasy is clearly associated with a variety of negative reactions in rats.

"We found that the low dose of ecstasy caused pronounced hyperthermia, rise in body temperature, and an increase in blood pressure," she says. "Both these symptoms were enhanced when low doses of caffeine were administered in advance. Our data showed that together these substances can alter heart function and body temperature."

Caffeine is a common ingredient in ecstasy tablets, not to mention everyday products like tea, coffee and 'high energy' drinks, so there is a clear public health message that not only is it dangerous to take ecstasy, but taking it with caffeine could have grave consequences.

Impact

- » Evidence that combining ecstasy with the common ingredient caffeine can increase damage to the body.

TAKE CONTROL OF YOUR DIABETES

Tackling negative perceptions about Type 2 diabetes can encourage patients to change their approach to taking care of themselves and improve specific health outcomes.

Almost 200,000 people in Ireland have Type 2 diabetes, but around a quarter of them are not even aware that they have it, and the number of new cases of Type 2 diabetes is predicted to rise here by one third over the next five years.

Many patients have negative beliefs or illness perceptions about their diabetes, which can lead to poor control of the condition, poor outcomes and additional care requirements in the long term.

Dr Susan Smith, Dr Karen Keogh and their team at Trinity College worked with 121 patients with poorly controlled Type 2 diabetes.

Of these, 61 had the usual care for diabetes, while 60 received additional motivational interviews to tackle false beliefs about diabetes each week for three weeks. The first two sessions were delivered with a family member present in the person’s own home; the final was a telephone interview with the patient alone.

Those who received the motivational interviews had better blood sugar control and psychological wellbeing, the researchers found. In addition, those patients were taking on board diet and exercise recommendations more readily compared to the group who received no intervention.

“As we progress towards treating chronic diseases in a primary care setting, it is essential that we understand which approaches will work, have the best outcomes for patients, as well as minimising impact on service delivery,” says Dr Smith.

“This study clearly shows that if the correct approach is taken in supporting patients when they find out they have a disease, they will take control of it more effectively themselves, improving their outcomes and reducing impact on services.”

Impacts
» An effective intervention for patients with poorly controlled Type 2 diabetes.
» Reduced costs in long-term as a result of patients managing their disease more effectively.

ALCOHOL LEADS TO UNSAFE SEX – HOW DO WE CHANGE THIS?

A new study that looked at the drinking habits of almost 400 young Irish people aged 19 – 31 years seems to confirm something we already knew: that binge drinking is linked to casual sex.

But is there more to it than that? Ironically, the research indicates that a simple health message highlighting that alcohol promotes risky sex may actually reinforce existing behaviours, not change them.

People who believe they are more likely to have unprotected sex when drunk, were in fact more likely to report doing exactly that. Meanwhile, those who believe that they know what they are doing when they have had too much alcohol were less likely to report that they engaged in unprotected casual sex when drunk.

Research conducted by Dr Grainne Cousins and colleagues at the Royal College of Surgeons in Ireland found that people seem to be actively ignoring safe sex advice and are not using a condom, in particular after binge drinking. While 90 per cent of people who had up to five alcoholic drinks used protection, this dropped to 60 per cent when they had more than six drinks.

Throughout the study, the researchers found a common denominator: people's intent. If they intended to use protection they were more likely to use a condom, whether they were having sex with a new, or a steady, partner.

However, turning intentions into actions is another matter. The study revealed that people were more likely to act on their intention if they had bought a condom, had one available, discussed use, or had agreement to use a condom.

Researchers say that to encourage a change in behaviour, interventions must be targeted on two levels. Firstly to change intent into action and secondly, to alter beliefs around casual sex when a person is drunk.

Impacts

- » Evidence to change approaches to health messages around alcohol and sexual health.
- » Demonstrates the need for solid research evidence rather than 'hearsay' to inform behavioural change.

WHAT, NO TEETH?

A new study warns that teenagers' lifestyle and diet choices are literally wearing their teeth away.

'Tooth wear' is where the teeth may look thinner, chipped, or smaller than previously, and sensitivity or 'tooth freeze' may be a complaint.

A study, involving teenagers in Cork and Kerry, found tooth wear in 40 per cent of 16-year-olds, to the extent that the surface was so worn that the tooth would not be able to repair itself. Given the increased life expectancy of this generation, the implications for demand and cost of tooth repair in the future are serious.

In terms of what causes the damage, it is the usual culprits. When questioned about diet and lifestyle, the teenagers with tooth wear drank more fizzy drinks, cider, put vinegar on food and were 'nail biters'. More boys had tooth wear than girls.

Those with fewer teeth affected were more likely to eat yoghurt and an apple a day; they also visit the dentist more often.

"It is not rocket science," says Dr Máiréad Harding at the Oral Health Services Research Centre in the Dental School and Hospital in University College Cork, where the research was carried out. "Our lifestyle choices affect

all aspects of our health, including our oral health. What is difficult is getting people to change their lifestyle choices."

Dr Harding adds that the findings relating to the impact of diet on teeth reinforce other health messages.

"For example, drinking fewer fizzy drinks will help protect teeth, but this could also reduce obesity. Equally, cider consumption has potential to impact on social, psychological and physical health, but it can also seriously damage your oral health. This clearly points to the need for a multi-disciplinary approach to health promotion."

Impacts

- » Clear evidence and advice to support diet and lifestyle changes in teenagers.
- » Support for a multi-disciplinary approach to health promotion.

INNOVATING HEALTHCARE POLICY AND PRACTICE



STROKE PATIENTS BENEFIT FROM INCREASED EXERCISE

Stroke causes one in every three deaths in Ireland, and patients who survive can suffer major physical disability. New research reveals that additional daily exercise routines, on top of routine physiotherapy, can significantly improve survivors' walking ability, balance, confidence and social participation.

In a simple but novel approach called FAME, Dr Emma Stokes, Dr Rose Galvin and Dr Tara Cusack, from Trinity College and University College Dublin, developed a short exercise programme to be delivered by the family and friends of people who survived acute stroke.

The role of family and friends was to assist the person in participating in a series of daily exercises and complete an exercise diary.

"Routine physiotherapy is certainly of great benefit to stroke patients, but this cannot be delivered on a daily basis," says Dr Stokes.

"The FAME approach created the opportunity for patients to be active and interact positively with family on a daily basis. After just eight weeks of intervention, we found that the patients in the FAME programme were experiencing significant improvement compared to those who were not. Their walking, balance and confidence had all improved."

Follow-up interviews clearly showed that patients and family found the programme

was beneficial to them physically and psychologically. Family members felt empowered by being able to do something constructive for their parent or spouse and they were under less strain after three months compared to those family members who did not participate in FAME.

The people with stroke stated that the involvement of their family members motivated them to carry out the exercises.

"This project shows how a simple intervention can improve patient recovery without demanding significant human or financial resources," says Dr Stokes. "It is a concrete, evidence-based model that could now be delivered in a hospital or a home setting."

Impacts

- » New training programme to improve stroke survivors' outcomes.
- » Better outcomes for patients with no additional pressure or cost to health system.

PLACENTA KEY TO IODINE SUPPLY IN PREGNANCY

New research has shown, for the first time, that during pregnancy the placenta may have the capacity to store iodine, which could potentially be released to compensate for inadequate iodine intake in the mother's diet.

Researchers at University College Dublin (UCD) and the National Maternity Hospital, Holles Street, made the discovery as part of a research programme that shows the Irish population - and pregnant women in particular - have mild iodine deficiency.

While severe iodine deficiency can lead to irreversible brain damage in a developing fetus, mild iodine deficiency during pregnancy has been shown to impact a child's IQ. Iodine is an essential component of thyroid hormones necessary for growth and brain development, and iodine deficiency is the largest single cause of preventable intellectual disability in children worldwide.

Given that Ireland is one of few EU countries that doesn't fortify salt with iodine (iodised salt), this discovery that the placenta can store iodine is potentially an important one.

"The placenta may have the ability to compensate for mild iodine deficiency," says Prof Peter Smyth, lead researcher at the UCD

School of Medicine, who undertook this work with PhD student Robert Burns and Prof Colm O'Herlihy of UCD and the National Maternity Hospital.

"This is a positive discovery which may explain why, despite their mothers being iodine deficient, Irish children still manage to achieve satisfactory brain development. However, we cannot ignore our other finding that the Irish population at large is borderline iodine deficient and that both children and adults would benefit from fortifying salt with iodine."

Impacts

- » Reduce fears around iodine deficiency in pregnant women.
- » Evidence to inform health promotion messages around iodine intake before and during pregnancy.

MANAGING WARFARIN YOURSELF

A trial of people who are on the blood-thinning medication warfarin shows that patients who self-monitor their blood-clotting ability, using an Internet-based expert system, have better outcomes than patients in routine care.

Warfarin treatment is prescribed to manage a variety of illnesses that are associated with the blood's ability to clot. For example, some people find their blood clots too easily, causing conditions such as deep vein thrombosis.

When people are taking warfarin, a key test to ensure that the patient is receiving an appropriate dose is to measure how long it takes before the blood clots using the International Normalisation Ratio (INR).

In Ireland most people on warfarin currently visit their GP or a clinic to have their INR measured and they also need frequent visits to hospital. Could this be managed in a more convenient and less time-consuming way?

Dr Susan O Shea at Cork University Hospital worked with Fiona Ryan and Stephen Byrne in the School of Pharmacy, University College Cork, to trial an Internet-based system that would allow patients to manage their warfarin remotely.

A total of 132 patients participated in the six-month trial, testing their INR at home using a portable meter. The result and personal details were then entered on a secure

Internet page, and instant feedback stated how much warfarin to take and when to perform the next test.

The results speak for themselves: -

- Patients reported a higher percentage of blood tests within their desired range compared to people in routine care.
- The number of people attending acute care was reduced.
- Patients had more freedom, one person was even able to go on a world cruise.
- More than 98% of patients surveyed preferred the patient self-testing.

The next step is to work towards implementing this effectively at a national level.

Impacts

- » More frequent monitoring for patients on warfarin without additional time spent in the clinic or hospital.
- » Reduced pressure on acute care system.
- » Enhanced patient satisfaction.

IMPROVING AWARENESS AFTER BRAIN INJURY

Researchers at the National Rehabilitation Hospital (NRH) have developed a simple, computer-based tool designed to increase a patient's ability to be aware of the mistakes they make and act on this. The result is an improvement in patient awareness.

People with particular types of brain injury are often no longer aware of the errors they make, and they will repeat the same mistakes without realising it. This interferes with their ability to care for themselves, take part in rehabilitation or relate meaningfully with others.

According to Dr Simone Carton, NRH and Dr Mary Fitzgerald, Trinity College, who lead the study; patients' rehabilitation looks to retrain the brain, and central building blocks to consciousness are the ability to be alert, pay attention, follow instruction, and most importantly, recognise when you make a mistake and correct it.

Researchers at NRH, Trinity, the Mercer Institute for Research on Ageing and UCD designed a training programme to address all of these factors in one simple test. It consisted of a series of nine images appearing in sequence on the computer screen in a repeat pattern.

Patients were asked to click the left mouse button on all images except the apple. The most important step being that they avoid

'clicking' the apple, or recognise that if they did click on it that it had been a mistake.

The first discovery was that the patient's awareness was greater than the researchers would have anticipated, indicating a readiness to be part of a rehabilitation programme. They also found that patients who received feedback on performance made a greater improvement in subsequent tests than those who did not. Family and carers of those who took part also perceived that patient's behaviour improved.

Impacts

- » New computerised tool that can help improve awareness in patients with brain injury.
- » New evidence for clinical practice to improve rehabilitation progress.



BETTER PRESCRIBING FOR PATIENT SAFETY

A new system stands to reduce the prescription of unnecessary, or potentially harmful, drugs to older people when admitted to hospital, thereby improving patient safety and substantially reducing prescription costs.

Researchers in University College Cork confirmed the validity of the new medication review system, called STOPP (Screening Tool of Older Persons' potentially inappropriate Prescriptions) and START (Screening Tool to Alert to Right Treatment).

It was created to help doctors and pharmacists avoid potential prescribing errors in older patients and to highlight when practitioners do not prescribe medication that would actually be of benefit to this age group.

The research looked at clinical and prescription details relating to more than 700 older patients in an acute hospital setting and applied the STOPP/START criteria.

"We found that one in every three of these patients received at least one potentially inappropriate drug," says lead researcher Dr Paul Gallagher. "A third of this group displayed symptoms attributable to adverse side effects of inappropriately prescribed drugs. We also found that over 40 per cent of patients were not receiving appropriate medication for common conditions including diabetes, stroke and osteoporosis."

By comparing the findings with similar cohorts of patients in six other European cities and getting similar results, the UCC group has helped to highlight the issue of inappropriate prescribing internationally as part of the global need to improve the quality and safety of prescribing practices.

STOPP/START recommendations and criteria have now been implemented as an audit tool in several countries, resulting in significant improvements in prescribing quality.

Further research is underway to find out if routine application of STOPP/START criteria reduces adverse drug reactions and prescription costs among older people admitted to hospital.

Impacts

- » Safer and more appropriate prescribing practices for older patients.
- » Less wastage of prescription drugs.
- » Reduced cost burden of prescription drugs.

CANCER MAP OF IRELAND

Newer and better 'cancer maps' could ensure that resources go where they are needed most.

Dr Avril Hegarty, a HRB Research Fellow at the University of Limerick, developed new computer techniques to produce a set of maps which show the variation of different cancers across the country. The information gathered could be very useful to have when making decisions on where to target health promotion and health information campaigns in higher risk areas.

The data came from two sources, the National Cancer Registry of Ireland and the Irish Social Science Data Archive. It covered the years 1994 – 2003. Eight cancers were mapped initially. These were four gastro-intestinal cancers (stomach, colorectal, oesophageal and pancreatic cancer) non-melanoma skin cancer, breast cancer, prostate cancer and cervical cancer.

The maps highlighted big variations for different cancer types. For example, non-melanoma skin cancer is much more common in coastal towns and cities than inland, while colorectal cancer is more common in the north-east, Donegal and Cork areas.

The new models are also capable of displaying changes over time, which could help monitor the impact of screening

programmes or other health interventions. The National Cancer Registry published an Atlas of Cancer in Ireland from the data at the end of 2009.

Impacts

- » An atlas of Cancer in Ireland.
- » Better evidence to target health promotion campaigns.
- » Improved ability to monitor and respond to trends that develop over time.

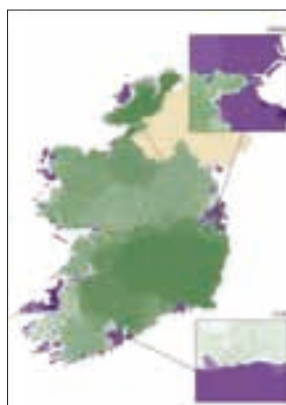


Figure 1
Non-melanoma
skin cancer



Figure 2
Colorectal cancer

BYE-BYE BED SORES

New patient repositioning technique reduces bed sores four-fold.

Lying in bed for days at a time might sound like heaven to some people. Unfortunately though, for patients who are confined to bed, sores or pressure ulcers can make the experience a misery. Sores can appear after a short period of being confined to bed, and they are notoriously difficult to heal.

But a new patient repositioning technique can reduce bed sores four-fold by applying a simple change to conventional repositioning practices.

Zena Moore, a HRB Research Fellow at the Royal College of Surgeons in Ireland and a practising nurse, has found a way to dramatically reduce pressure ulcers among elderly patients that could introduce significant savings and efficiencies in the delivery of care.

“The new method uses a 30 degree tilt rather than 90 degree rotations,” explains Ms Moore. “It results in a four-fold reduction the incidence of pressure ulcers, so it is clearly better for patients. But it is also less time consuming. It requires less nursing staff and it is more cost effective when compared with standard care.”

“The potential cost savings of this change in practice across the HSE are enormous,” she adds.

“Our nursing research estimates show that the new method could save over €250,000 through a reduction in staffing costs and wound dressing costs alone. This is based solely on the number of patients who would require repositioning in the 12 hospitals that participated in our research. If you extended this out across the HSE, it could introduce significant savings and efficiencies.”

As President of the European Wound Management Association, Ms Moore is determined to put these findings into practice on a national, EU and international level.

Impacts

- » Fewer bed sores for patients.
- » More efficient use of time for nursing staff.
- » Significant cost savings on wound dressing.



ARTIFICIAL LIMBS: HOW TO GET THE MOST OUT OF THEM

Losing an arm or leg is a major event in someone's life. As well as the physical loss, there is also a social and psychological impact. New research has examined factors that influence those effects and help determine how people use artificial limbs, or prostheses.

"Artificial limbs are expensive so there is an onus on health professionals to get the best possible result. This allows the person to live an optimum life and it gives them the best chance of contributing to family and community life," says Dr Pamela Gallagher from the School of Nursing, Dublin City University.

She and her team looked at both upper limb loss (hand and arm) and lower limb loss (leg).

"We found that disability is not a result of impairment alone," says Dr Gallagher. "There are a number of other factors including the physical, social and personal. There is very little scientific study on all the factors which can affect this, but through our research we have been able to identify a core set of approximately 40 different things which need to be considered by the patient and their rehabilitation team or professional."

The study found differences between what the patient wants, needs and considers a success and how a rehabilitation professional

would classify success. It also explored ways to improve the initial prescription process and to involve the patient more in their care and choices.

"We found that all these factors played a part in patients accepting the artificial limb and then getting the most out of it," says Dr Gallagher.

This research is the first of its kind in the world and uses a unique mix of techniques. It offers a solid basis upon which to calculate cost-benefit analysis for each patient and their unique set of circumstances.

Impacts

- » Better outcomes for patients undergoing rehabilitation with prosthetic limbs.
- » Guidelines to help rehabilitation professionals.
- » More efficient and targeted spending on equipment.

POWER OF POSITIVE SUPPORT

Simply telling a first-time mum that she's doing a good job can greatly reduce her chances of postnatal depression.

Postnatal depression affects around 10 per cent of first-time mothers, affecting not only the mother but her child and family too, and placing demands on health services.

Dr Patricia Leahy-Warren, an HRB-funded nurse researcher at UCC says, "We wanted to look at how social support and a mother's own feelings about how she was managing the new arrival could impact on her mental wellbeing," says Dr Leahy-Warren.

For the study, 560 first-time mothers completed a questionnaire immediately after birth and then at six and 12 weeks later.

The greatest sources of support that the new mothers identified were their partners and their own mothers and family. The higher the levels of social support and the parents' own beliefs about their ability to be successful in the parenting role, the lower the level of postnatal depression.

Strikingly, mothers who got little support, in the form of people letting them know they were doing a good job, had nearly nine times the risk of being depressed at 12 weeks when compared with mothers who had high levels of such appraisal.

Meanwhile, mothers who had low levels of professional support at birth had nearly three times the risk of being depressed at 12 weeks.

"Social support needs to be better understood by health professionals as it is crucial to preventing postnatal depression and positively influencing mothers in managing care for their babies," says Dr Leahy-Warren. "And that's not to mention the potential cost savings to the healthcare system. These findings need to be integrated into healthcare policy and clinical practice."

Impacts

- » Potential to reduce postnatal depression rates.
- » Consequent savings for health services.



MMR UPTAKE AFFECTED BY SOCIAL CLASS AND ALTERNATIVE MEDICINE

Irish women from the most disadvantaged backgrounds are least likely to immunise, and among more affluent mothers, those who use complementary or alternative medicine are availing less of Measles, Mumps and Rubella (MMR) vaccinations for their children.

Researchers from University College Dublin, NUI Galway and the Health Service Executive sought permission to examine primary care and hospital records of 749 children from a variety of different backgrounds in rural and urban Ireland who had taken part in the Lifeways study.

They found that 88.7 per cent received the first MMR vaccination, which is below the recommended threshold for population protection.

When they cross-checked against socio-demographic profile and lifestyle parameters, they showed for the first time that factors other than disadvantage influence the uptake of the MMR vaccine.

“We found that certain social, lifestyle and health characteristics of the mother may influence her decision to have her child immunised,” says lead researcher Prof Cecily Kelleher, UCD.

Higher levels of immunisation were found in the east of Ireland and among mothers who were not eligible for free medical care, were employed, had higher incomes, did not use complementary or alternative medicine and had a maximum of three children.

Lower levels of immunisation were associated with west of Ireland, free medical care, smokers, lone parents, unmarried mothers, those not working and those whose mothers used complementary and alternative medicines.

“A clear understanding of what influences mothers to vaccinate provides solid evidence to target and position key health messages with more impact,” concludes Prof Kelleher.

Impact

- » Solid evidence for effective targeting of health messages around MMR.



**PROMISING DISCOVERIES
AND POTENTIAL
TREATMENTS/THERAPIES**

CHANGING THE WAY WE THINK ABOUT SCHIZOPHRENIA, BIPOLAR DISORDER AND AUTISM

A study that started off looking for genes involved in schizophrenia and bipolar affective disorder has found that the conditions share some genetic links with autism.

Prof Aiden Corvin's lab in Trinity College Dublin worked with international partners on a large scale research project to understand more about genes that contribute to schizophrenia.

In the Genome Wide Association Study (GWAS), the researchers carried out genetic analysis of samples from participants around Europe.

By looking at most of the genes from each individual, they were able to compare genes from groups of people with schizophrenia and bipolar affective disorder and a 'control' group who did not have the conditions.

"If you use large enough numbers in these studies, you can begin to see patterns emerge. The study identified a number of genes and biological pathways involved in susceptibility to schizophrenia and bipolar affective disorder," explains Prof Corvin.

"We have demonstrated that genes which regulate how brain cells bind together and communicate may be particularly important in schizophrenia and bipolar affective disorder," he says.

But an unexpected finding was that closely related genes and biological pathways have also been implicated in autism.

"For us, this result is fascinating and challenges how we currently classify mental disorders. It also offers new insights into the underlying biology involved," says Prof Corvin.

"My group and others are actively working on translating these findings into new diagnostic approaches and treatments. We have been fortunate in having the support of Irish patients and their families; and research funding agencies, including the HRB, in being able to contribute substantially to international efforts to make progress in understanding these often devastating disorders."

Impacts

- » Better understanding of schizophrenia, bipolar and autism disorders.
- » New potential avenues for diagnosis and treatment of all three disorders.

BALLOONS DELIVER GENES TO TACKLE RARE DISORDERS

The idea behind gene therapy is simple: if a defect in a gene causes an illness, then give someone the right gene and you can cure them.

But the reality is much more complex. For one thing, getting the genes inside the right cells in the body is not always easy, and many researchers rely on 'friendly' viruses – ones which have the nasty bits removed or de-activated – to try to deliver genes to combat illness.

Now Prof Abhay Pandit and his team at NUI Galway are exploring a new technique that removes the need to use these viruses altogether. Their approach is based on nanospheres, or tiny particles made in the laboratory that can be produced according to exact specifications.

They have been working on using nanospheres to deliver a gene to combat Recessive Dystrophic Epidermolysis Bullosa (RDEB), a rare genetic disorder where a defective gene stops the cells from anchoring to the skin. The slightest contact can cause severe blistering or sores comparable to second-degree burns. In severe cases life expectancy is short and there is currently no cure.

“We have been able to prove that this is potentially a very useful therapy,” says Prof Pandit.

“The nanospheres can be injected into the patient and we are looking at the possibility of delivering them through ‘smart wound dressings’. The nanospheres degrade soon after they deliver their genetic medicine/ payload. These types of delivery mechanisms could be very useful for other diseases, not just RDEB, where targeted delivery is required.”

Impact

- » Potential for a new mechanism to deliver gene therapy to treat a range of diseases.

ASTHMA RESEARCH LEADS TO MRSA FINDING

Research in one area can sometimes lead to an unexpected, but welcome, spin-off in another. In this case, research on asthma has led to the discovery of a possible new agent to fight antibiotic resistant bacteria.

Professor Bernard Mahon and his team at NUI Maynooth's Institute of Immunology were looking at proteins that occur in the lung in asthma.

Previous research had shown that one particular protein was present in higher levels than normal in the asthmatic lungs of mice.

This protein is important because it helps to trigger other proteins that kick-start a type of 'immune response' in the body that can contribute to the allergic reactions often seen in asthma.

"Our team found that an infection could boost levels of this first protein," explains Prof Mahon.

"We discovered that infections could also lead to an increase in the first protein, which in turn set off a chain reaction which could make the asthma worse. We therefore found a link between infections and exacerbation of asthma," he says.

But that wasn't all – the first protein also had a potentially useful secret, which the NUI Maynooth research team found.

"We discovered that a small fragment of this first protein had powerful anti-microbial properties. We were able to isolate and develop this compound so that it was much stronger. It has the potential to treat serious infections, especially in people who are allergic to existing antibiotics."

The discovery, which has been patented, could offer a new agent to treat MRSA and other clinically important bacteria that have become resistant to conventional antibiotics.

Impacts

- » A potential new antibiotic to treat MRSA and other superbugs.
- » Patent developed.
- » New understanding on the link between infections and asthma.

NEW INSIGHTS INTO A WOMAN'S HEART

It's pretty obvious that men and women are not the same in many ways: but differences can even crop up in the stickiness of our blood cells, according to research findings.

Cells in the blood called platelets can clump together to form clots. This is important in healing after a cut, but if a clot forms and stops blood flow to the brain or heart, it can result in a stroke or heart attack.

People at risk of these inappropriate clots may take drugs to reduce the clotting process, but they don't work well on everyone – some patients may have 'stickier' platelets that make them more prone to clotting, and knowing about this stickiness can help to predict a patient's risk.

HRB-funded researcher, Dr Aaron Peace, has developed a new test to measure platelet function, and has been able to identify patients with 'sticky' platelets who may be at higher risk of heart attack or stroke. These patients could benefit from more aggressive therapy.

He also used the test to compare platelets from male and female patients: "I found that platelet stickiness differs between women and men. To further elucidate the mechanism for this difference, we examined whether oestrogen and progesterone mediate platelet responses, and found that they did," says Dr Peace.

"These findings need to be considered in the future design of hormone replacement therapies in females and in the treatment of heart disease in men and women."

Impacts

- » New test to measure platelet function.
- » Insights into how female hormones affect blood cells and cardiovascular risk.

PROTECTING AGAINST A DANGEROUS SUPERBUG

Clostridium difficile (*C. diff*) is a superbug - a type of bacteria that has developed resistance to many common antibiotics. Finding new treatments to combat it are essential.

C. diff is particularly dangerous for elderly patients, especially those with an underlying serious condition. It causes diarrhoea, which can lead to severe dehydration, which in turn affects the patient's overall health. And once someone gets *C. diff*, it has a tendency to reoccur and they can enter a downward spiral.

HRB Clinician Scientist, Dr Lorraine Kyne at the Mater hospital and her team, investigated the superbug at a molecular level. From this research, she was able to make some basic new discoveries about how the infection attacks the body. The findings offer new ways that she and other researchers can use to look for treatments and therapies to combat *C. diff*.

"Our research has a couple of major impacts for patient care," says Dr Kyne. "We were able to develop a set of indicators which could predict those patients most at risk of a reoccurrence. This allows us to take proactive infection control measures to minimise that risk for them.

"Additionally, the research formed the basis for a set of national guidelines for the surveillance, diagnosis and management of *C. diff*. The funding we received from the HRB was hugely important in allowing us to form networks with other researchers and the Health Protection Surveillance Centre. *C. diff* is now a notifiable disease, and we now have the capability to monitor, manage and control any outbreaks that occur in Ireland."

Impacts

- » Better understanding of *C. diff* at a molecular level.
- » Ability to predict patients at risk of reoccurrences and take proactive measures to protect them.
- » National guidelines on the management and control of the disease.
- » Some direction for research into effective therapies.

CHEESE AND YOGHURT COULD DEFEAT HOSPITAL SUPERBUGS

Bacteria that ferment food can protect against MRSA and other superbugs.

Cheese and yoghurt are made when 'good' bacteria react with milk in a process called fermentation. These 'good' bacteria have evolved ways to protect themselves from other harmful bacteria that might also be present in fermenting milk, and they release a range of antibiotics called bacteriocins that can kill invading or competing bacteria.

HRB-funded researchers, Dr Paul Cotter, Prof Colin Hill, Prof Paul Ross and Clare Piper from Teagasc Food Research Centre and University College Cork have studied two such natural antibiotics.

Nisin and lactacin-3147 seem to be very effective against two well known hospital superbugs; MRSA and VRE, according to Dr Cotter.

"These natural antibiotics stop both superbugs from growing," he says, describing how the researchers use bioengineering techniques to make these bacteriocins even better killers of superbugs.

"We take out the gene that makes the antibiotic, change it slightly and then put it back in. In this way we can develop a whole range of bacteriocins that work against

everything from plaque causing bacteria to hospital superbugs such as *Clostridium difficile* (*C. diff*) and MRSA."

The group's early tests indicate that the bacteriocins are often as good as, if not better, than standard antibiotics, and bacteria seem to have a harder time developing resistance to them.

"Up until now our research has been building up a solid foundation so that we can move with confidence to the next stage in testing," says Dr Cotter. "It's probably another three to five years before we actually see these in clinical use, but they do hold vast untapped potential to change the way we fight infections."

There are currently two patents pending, covering over 50 different bioengineered bacteriocin compounds.

Impacts

- » Potential to revolutionise the fight against infection worldwide.
- » Two patents pending.

MALARIA PARASITE COULD BE 'STARVED' TO DEATH BY NEW TREATMENT

Malaria affects between 350 and 500 million people and kills an estimated one million people worldwide every year; the majority are children and pregnant women. There is still no vaccine to protect against it and treatment is expensive.

Dr Angus Bell and his research team at Trinity College have produced new research findings that open up the possibility of drugs to literally starve the malaria parasite of food within the human body.

"We found an enzyme that the parasite uses to digest human protein for its own food," says Dr Bell. "The protein is haemoglobin which is found in red blood cells. The parasite lives in red blood cells and eats the haemoglobin that surrounds it. Our work indicates that if you stop this enzyme from working that this effectively starves the parasite, and it dies. This opens up the possibility of designing a drug that stops the enzyme from working. However, we need to be careful that any drug does not affect human forms of the same enzyme that our own cells use."

"There's a way to go yet before we could start talking about a possible cure, as there are several different enzymes involved in digesting haemoglobin and the next step is to figure out exactly which ones the parasite needs to survive," says Dr Bell.

"If we can do this, it should point the way to a very promising candidate drug to treat malaria."

Impact

- » Likely pathway to create a drug that could cure malaria.

OBESITY LINK TO CANCER RISK

Some types of obesity are more dangerous than others. Abdominal obesity - which most people would probably simply call a 'pot belly' - is known to be linked to a higher risk of strokes and heart attack, and there is increasing evidence that it can increase the risk of particular cancers.

Now HRB-funded researchers have found a link between having a pot belly and having a higher chance of developing more aggressive breast or colon cancers.

"This type of obesity is part of a suite of risk factors called the 'metabolic syndrome'," explain Laura Healy and Dr Aoife Ryan from the research team at St James's Hospital.

"Metabolic syndrome, or MetS, is a term to describe the presence of a mixture of health conditions in an individual that increases the risk of developing heart disease or diabetes. It includes central obesity, or having a pot belly, high blood pressure, and low levels of good cholesterol, amongst other factors," they say.

Their study involved people who had been diagnosed with breast or colorectal cancer and they found that patients with MetS seemed to have a higher risk of developing a more aggressive tumour. This means the tumour might be a bigger size or it has

spread more quickly compared to patients without the MetS.

"These findings show that MetS may influence the start or the advance of cancer development, and correcting these abnormalities represents an exciting area of research for the future prevention and treatment of cancer," say the researchers.

"This is significant for those at risk of developing the cancer as well as helping cancer survivors remain disease free. However, lifestyle changes which include increasing exercise and eating a balanced healthy diet to achieve or maintain a healthy weight, are still the most important way of preventing the development of MetS and obesity."

Impact
» Potential to prevent and reduce cancer risk through food and diet.

DEVELOPING RESEARCH WITHIN THE HEALTH SYSTEM – REVIEWING PROGRESS



CLINICAL RESEARCH FACILITIES

Significant progress has been made in recent years on the development of Clinical Research Facilities in Ireland. The HRB is funding three facilities, one in Dublin with the Wellcome Trust and one each in Galway and Cork.

The fundamental purpose in developing these centres, which will all be on hospital sites, is to put research at the heart of the health system in order to improve outcomes for patients.

Development of clinical research facilities is helping to ensure that clinical studies can happen in a safe and regulated environment, they allow patients to access trials across Ireland and internationally, and they help to drive the education and training of healthcare professionals.

In Dublin, the clinical management and operations teams have already begun laying the scientific foundations and have started clinical research activities through the Dublin Centre for Clinical Research Network.

Key progress includes: -

- More than 600 patients were recruited to clinical studies in 2009.
- Four clinical research studies are underway in the areas of Diabetes, Pulmonary Disease, Neuropsychiatry and Gastroenterology.
- The creation of nine full-time and two part-time jobs.

Great progress has also been made in the **HRB Clinical Research Facility, Galway**. Research has started before the building work is complete. The first stem cell trial ever conducted in Ireland is being carried out at the facility in Galway in 2010. Patients with Crohn's disease are being treated with cutting-edge stem cell therapy in the hope that this will lead to revolutionary new forms of treatment for specific patients with this disease.

Key progress includes: -

- Almost 200 patients were recruited to clinical studies in 2009.
- 21 clinical research studies were already under way in the areas of Diabetes, Cancer, Nephrology, Dermatology, Psychiatry and Gastroenterology.
- The creation of six full-time and two part-time jobs.

In Cork, work is expected to begin on the clinical research facility soon. The team in Cork are working to set up a programme of clinical research to study pharmabiotics and human nutrition, cardiovascular disease and cancer.

DEVELOPING A ROBUST CLINICAL RESEARCH NETWORK – ICRIN

Ireland has the potential to be a leading country for quality clinical research including clinical trials, to be a partner of choice in multi-national clinical trials and to generate innovative products to improve health, health services and help exploit economic benefits in this area.

The HRB and HSE co-funded a project called Irish Clinical Research Infrastructure Network (ICRIN) to position Ireland to achieve our potential in this area. The main aim is to streamline training, processes and practices in all aspects of clinical research in Ireland in order to support academics, healthcare professionals and industry involved in clinical research activity. It is managed by Molecular Medicine Ireland (MMI).

Since its establishment ICRIN has been at the forefront of developing a strong foundation for clinical research in Ireland. Recent impacts are outlined below: -

The publication of the Clinical Research Roadmap in June 2010, which is a landmark achievement. It looks at ways to implement aspects of the Action Plan for Health Research published by the DoHC and highlights: -

- The strategic and operational changes needed to improve Ireland's capacity to undertake high quality, multi-centre clinical research.

*Royal College of Surgeons in Ireland, University College Dublin, Trinity College Dublin, NUI, Galway and University College Cork and their affiliated teaching hospitals.

- The changes needed to develop new medicines, diagnostics, therapeutics and medical devices and to allow Ireland participate in European research initiatives.
- How we can create a coordinated, networked clinical research system in Ireland.
- Establishing ethical approval systems and coherent research governance

A working group among ICRIN Partners* has now been established to address just some of the coordination and networking issues laid out in the clinical research roadmap.

Clinical research training

ICRIN has provided a total of 15 courses in Good Clinical Practices and Good Research Practices in 2009 and 2010; attracting 370 participants from all aspects of clinical research activity in Ireland.

Impacts

- » A roadmap for clinical research in Ireland.
- » Competency training in good clinical and research practice.

CANCER CLINICAL TRIALS

A €20 million investment in the development of a network of cancer clinical trials, in 17 hospitals across Ireland by the HRB, means a substantial proportion of Irish patients have the option to participate in the latest clinical trials and have access to the latest therapies to improve patient care.

The network has put Ireland in a position of strength in terms of having the critical mass and capacity to participate in large scale cancer clinical trials. More than 3,000 patients have already benefited from access to trials here.

Irish participation in a breast cancer trial called the TAILORx study was only possible because the network is established. Women diagnosed with early stage breast cancer are mostly advised to receive chemotherapy in addition to radiation and hormonal therapy. But research has not demonstrated that chemotherapy benefits all of them equally.

TAILORx seeks to incorporate an additional test into clinical decision-making, sparing women unnecessary treatment if chemotherapy is not likely to be of substantial benefit. The TAILORx study, with 700 participants in Ireland and over 10,000 participants across the Americas, is one of the first trials to examine a method for personalising cancer treatment.

This is positive for the women avoiding the unpleasant and painful side effects of

chemotherapy and for the health service as it becomes more effective in delivery of care.

The benefits of establishing the clinical trials network and conducting cancer research do not stop with the patient. Quality systems and financial savings are also evident.

Hospitals operating the trials must adhere to the stringent regulation and protocols required for conducting trials. This naturally means high standards – all boats rise on a high tide – so to speak. The economic benefits are also considerable. During 2008 it was established that Irish Health Services saved €3.5 million on drugs and treatments because of the availability of cancer clinical trials here.

Impacts

- » Ability to participate in some of the world's best clinical trials.
- » Cost savings and efficiencies in the health service.
- » Improved quality standards in hospitals due to the stringent regulations required to conduct trials.

PERINATAL IRELAND

Diagnosing problems early in twin pregnancies

Perinatal Ireland is an all-Ireland research consortium funded by the HRB. It focuses on carrying out research to improve the standard of healthcare for women and children in Ireland. It brings together the expertise of eight of the leading maternal-fetal medicine centres and specialists in Ireland with a dedicated, world-class research infrastructure and resources to form a unique research environment.

The group uses ultrasound technology to improve outcomes for mothers and their babies, particularly in cases where complications can interfere with healthy growth and development.

Perinatal Ireland has completed its first major study: Evaluation of Sonographic Predictors of Growth Restriction in Twins (ESPRiT Study). In it, they looked at using ultrasound during pregnancy to better understand, and pick up early on, problems where one or both twins are not thriving.

The study involved more than 1000 mothers expecting twins. Each mother had ultrasound checks during her pregnancy to check factors like how the babies were growing, how blood was flowing to the twins in the womb and the structure of the placenta.

The researchers were looking for answers about important clinical issues, such as how much a difference between the growth rates of twins indicates there's a problem for one or both of them, and how best to detect those differences using non-invasive techniques like ultrasound.

The major findings of the ESPRiT Study will be presented at leading international meetings from early 2011 onwards.

Impacts

- » Better understanding of fetal growth in twin pregnancies.
- » Better diagnostic methods to pick up early on possible problems in twin pregnancies.

