

Institution: University of Sheffield

Unit of Assessment: 3A - Allied Health Professions, Dentistry, Nursing and Pharmacy: Dentistry

a. Context

Sheffield's Schools of Clinical Dentistry, Nursing and Midwifery, and Department of Human Communication Sciences work together and share common policies and resources under the strategic leadership of the Faculty of Medicine, Dentistry and Health (FMDH). The scope of our research is understandably diverse, as anticipated by the UoA3 descriptor, but the connecting theme is our focus on improving human health and quality of life.

We maximise impact through rigorous preclinical and translational research communicated through peer-reviewed publications by networking at major conferences and working with key user groups. Research is carried out in multidisciplinary thematic research groups that are fully described in REF5. These harness the specific strengths of the three departments, each of which has developed a research strategy and structure, reflecting the expertise and interests of its staff and the very different clinical challenges that are faced in each field.

Key stakeholders and beneficiaries:

NHS. Our primary aim is to improve the health and wellbeing of patients and the public, directly by impact on the quality and/or cost efficiency of healthcare delivery in the UK and overseas, and indirectly by influencing national policy and informing guidelines and operational protocols. Our engagement and collaboration with our NHS partners and the wider healthcare community is the main gateway for this impact.

Industry. Our research delivers economic benefits via support for development of health technologies and medical devices to more than 25 national and international industrial partners ranging from SMEs to large multinational companies.

Major charities/Third sector. Our work has seen significant engagement with major charities and patient groups locally, nationally and internationally.

Society and the education sector. Working with the community locally and nationally, we have enhanced public understanding and knowledge transfer.

Types of impact:

Our research has a strong influence on clinical practice and patient care, through evaluation of healthcare interventions and incorporation of findings into clinical guidelines. Specific examples include informing national guidelines on oral cancer screening, for preventive dentistry ("Delivering Better Oral Health", DH 2009) and for palliative care, the provision of accessible information for people with aphasia, and European guidelines on quality outcomes in care homes. More widely, commissioned research informed the Health and Education National Strategic Exchange (HENSE) review of the NHS workforce and student numbers.

Working with industrial partners we have developed new materials and have evaluated healthcare interventions including anti-scarring agents in nerve repair, novel analgesics, new bone cements and developing patient-centred outcomes for the evaluation of new products. These projects have resulted in considerable inward investment as outlined in section b.

Charity and education sector impacts include shaping the national debate on the dignity in care agenda through our work on the four-country *My Home Life* initiative (with AGEUK and AGE Cymru) which reaches 18,000 care homes. Direct impacts on educational programmes support children whose communication development is affected by social disadvantage or is shaped by multilingualism. Public engagement has included participation in "Researcher Nights" and a staff member (Whawell) who is scientific adviser to the Eureka! National Children's Museum in Halifax.

Impact template (REF3a)

b. Approach to impact

The three departments actively implement the University of Sheffield's strategy for Innovation, Impact and Knowledge Exchange (IIKE). This provides a framework to encourage and reward staff to engage with end users and industry and to translate research into practice. Impact is also driven by the Sheffield Healthcare Gateway (which has a member of our staff (Hatton) as Deputy Academic Lead), and the Industrial Knowledge Forge (InkForge), which support networking events with industry and provide the expertise for negotiations on financial and resource issues and contracts. (<http://shg.sheffield.ac.uk>).

Engagement of end users and beneficiaries

We work closely with the NHS with whom we share facilities and research governance, thus maximising rapid translation of research to clinical practice. The University and Trust have established Academic Directorates, which capitalise on NIHR funding and manage research jointly. We have an Oral and Dental Academic Directorate with a joint research management structure including a jointly funded Research Support Officer with specific responsibilities for developing clinical research and building industrial collaborations. We have access to the NIHR Clinical Research Facility, and Research Design Service. An example of our success is the fact that in 2012 clinical research in the unit recruited more patients into oral and dental portfolio trials than any other group in the UK (e.g. US NIH funded trial on cytology in oral dysplasia (PI Thornhill, \$2.3M) recruited 380 patients)

Much of our research has been driven by specific clinical challenges (e.g. studies to enhance nerve repair, oral cancer screening projects, cleft palate studies, and development of novel computerised treatments for aphasia and apraxia of speech). This "bench to bedside" approach is being fostered in our departments, and has been further enhanced by forming research groups that integrate basic scientists and clinicians (e.g. in head and neck cancer and bioengineering approaches to nerve regeneration and facial reconstruction).

One of our key approaches to impact is through knowledge exchange with industrial end users. Individuals and research teams have a proactive approach in identifying key end users within their particular field of expertise and we encourage and support grant applications which facilitate and build collaborations. Examples include an EU 'Research for the Benefit of SMEs' grant (PI: Miller, £1.2M, £500k to the Unit), EPSRC Centre for Innovative Manufacturing in Medical Devices, with five universities and 13 SMEs (£6.9M, £220k to the Unit PI: Hatton), funding from GSK to develop patient-centred outcomes for clinical trials (PIs: Robinson, Gibson. £0.6M to the Unit), MRC/Astra Zeneca Compound Competition (PI: Andrew, £1.2M, £585K to the Unit), BBSRC/Pfizer Industrial Partnership Award to identify novel analgesic targets (PI: Boissonade, £0.8M, £422K to the Unit), a number of RCUK CASE awards (e.g. with Pfizer, Eli Lilly, GSK, Renovo, Haemostatix) and 13 MRC, HEIF or White Rose-funded Pilot or Proof of Concept awards. In total this funding exceeds £11M. Departments are members of key networking organisations such as the KTNs, N8, regener8, Medilink and staff have led network events including a 'Dental Materials' Knowledge Transfer Network (March 2012) and a Faculty Health Technologies Industry Day (June 2013)

Similar proactive strategies have created impact on society via the education and charity sectors. Examples include evaluating the impact of training programmes for children and young people with communication needs as well as engagement with major charities locally (e.g. Darnall Dementia Group), nationally (e.g. AGEUK, AGE Cymru, Stroke Association, ICAN) and internationally (e.g. Swedish National Carers Competence Centre, whose International Advisory Group Nolan Chairs).

c. Strategy and plans

The departments will continue to align with the University IIKE strategy and proactively engage with the Healthcare Gateway and InkForge. Our impact goals and strategic plans include:

1. To create and maintain deeper partnerships with external organisations nationally and within our city region

1.1 We will utilise more fully, and build on our links with our NHS partners and other healthcare providers including the Yorkshire and Humber (Y&H) Academic Health Sciences Network,

Impact template (REF3a)

(specifically designed for early implementation of research to generate health and wealth), NIHR bodies, the Y&H CLRN and CLAHRC and patient/user advocacy groups.

1.2 Working with the Healthcare Gateway we will promote and develop translational health-related research partnerships. We are currently working with the Gateway to negotiate further collaborations (e.g. with Unilever, GSK, AstraZeneca, Colgate, Giltech) and deepen civic engagement with our Local Enterprise Partnership (LEP).

1.3 Staff will be encouraged and supported to increase participation in, and to organise networking events, for example the Annual Health Technologies Industry Day, Knowledge Transfer Networks and meetings with industry to showcase their work.

1.4 We will provide greater support for staff to expand applications to EU (Horizon 2020), national and University schemes that fund collaborations with external partners, including Centres of excellence, Industrial Partnership Awards, CASE and Proof of Concept awards (e.g. HEIF, MRC).

2. Societal impact and engagement with the wider community

We will continue to support and fund staff to participate in national and University public engagement events (e.g. Researchers Nights, Festival of the Mind, Sheffield Festival of Science and Engineering, The Mobile University, National Children's Museum).

3. Making the most of our intellectual property

University intellectual property is commercialised through our partner Fusion IP plc and is facilitated by the Healthcare Gateway and Research & Innovation Services. We will encourage staff to communicate at an early stage in project development to identify protectable IP, and enable us to maximise the impact of our ideas and knowledge.

4. To embed a culture of impact and knowledge exchange

Impact and knowledge exchange are embedded in the annual appraisal and review processes as key performance indicators for all staff. This ensures that impact is part of our culture and our researchers are in touch with the needs of our end-users. We will also encourage staff to engage with the university's involvement in major national initiatives for impact (e.g. the BBSRC "Excellence with Impact" programme).

d. Relationship to case studies

Our four case studies reflect the diversity, scale and reach of our research and its impact on industry, the NHS, patients, and society. They exemplify the non-academic impact of our work and demonstrate the qualitative and quantitative benefits in terms of improvements in health, wealth, and changes to protocols and policies.

The glass-ionomer bone cement impact case study illustrates a bench to bedside approach to research and its direct benefits to health – with potential lives saved and prevention of deafness in a significant number of patients. It also shows how research can be commercialised to create a new UK company, creating jobs, exports and wealth.

SWORD shows a clear pathway from basic cognitive neuroscience research to benefits for patients and practitioners. It demonstrates the commitment of Human Communication Sciences to conducting experimental work with the *a priori* strategic aim of developing innovative applications for improving health provision and quality of life in people with communication disorders.

Our powered toothbrushes case study shows how properly conducted systematic reviews can demonstrate the efficacy of a particular oral health aid, and thereby influence national guidelines as well as commercial product development and marketing. Beneficiaries are primarily the public but also include industry and commerce, thus creating wealth and jobs

The Enhancing Care for Older People case study illustrates how our research can have significant national reach. This project has influenced national initiatives (the "Senses" Framework and *My Home life* programme) which have changed the culture in the management and delivery of care home services, impacting on nearly 20,000 homes and almost 0.5M people