Institution: Glasgow Caledonian University

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

a. Overview

This Unit spans:

1. The Institute for Applied Health Research (IAHR);

2. The Yunus Centre for Social Business and Health;

3. The Nursing, Midwifery and Allied Health Professions Research Unit (NMAHPRU) co-hosted with the University of Stirling and funded by the Scottish Government's Chief Scientist Office (CSO) with additional financial support provided by Glasgow Caledonian University (GCU) and Stirling,

4. A strategic partnership with the NHS Health Protection Scotland Unit (HPS).

The research is structured across the span of the Unit as two major, integrated, and interdisciplinary research programmes:

- ***Managing and Living with Long-Term Conditions*** (with thematic research groups in 'Diabetes and Biomedical Sciences', 'Applied Vision Research', 'Musculoskeletal Rehabilitation' and 'Stroke Rehabilitation').
- ***Promoting and Protecting Health and Wellbeing*** (with research groups in "Healthy Ageing', 'Anticipatory Care' and 'Infection Prevention and Control').

b. Research Strategy

b.1 Research environment: The IAHR was established in 2009 and evolved from the legacy of HealthQWest (a West of Scotland pump-priming consortium funded by the Scottish Funding Council, Scottish Government, CSO, and NHS Education for Scotland). It now encompasses a broader allied health professional, nursing, and academic disciplinary base, drawing upon work that was previously submitted to three units (UoA12a, 12b and 44) in RAE2008. It has maintained its strategic alignment and increased its investment with the NMAHPRU and significantly grown its portfolio to incorporate HPS (the national agency which protects the population from infectious and environmental hazards) and the Yunus Centre for Social Business and Health.

b.2 Achievement of strategic aims (2008-2013): The Unit has achieved its strategic aims within the assessment period as evidenced by:

1. Programme expansion: Through additional strategic investment in research capability, and the expertise and support of its partners, the Unit has built two larger, integrated and interdisciplinary programmes of research that, **a)** Broaden and deepen the interdisciplinary base allowing us to tackle complex health problems with a more holistic approach, and **b)** Align the IAHR more directly with current national and international policies and initiatives.

2. Performance against key deliverables: The Unit has successfully:

a) Increased its portfolio of external funding to include the UK Research Councils (The Medical Research Council [MRC]), The European Commission (EC), The National Institute for Health Research (NIHR), and the Scottish and UK governments as well as consolidating established track records with UK medical charities. This funding includes, for example, the €5.3m *A-FOOTPRINT* project (EC FP7, Woodburn), the £1.9m 'Multicentre randomised trial of the effectiveness and cost-effectiveness of basic versus biofeedback-mediated intensive pelvic floor muscle training for female stress' (NIHR-HTA, Hagen), and the £2.3m 'Developing methods to evidence social enterprise as a public health intervention' (MRC/ESRC, Donaldson). The Unit achieved a 12.2% increase in external grant expenditure with a total value of grants awarded of £16,007,974.

b) Made strategic appointments to provide research leadership and build critical mass. This has enabled the Unit to deliver larger-scale, interdisciplinary and externally funded projects within the period whilst building long-term research sustainability. Key external appointments were made at all levels from Chairs (e.g., Donaldson, Steultjens and Hutchison) to early career researcher (ECR) posts (e.g., Mason, Hendry and Telfer).

c) Made key investments in infrastructure and facilities (e.g., IAHR research hub and laboratory refurbishments) which has supported the Unit's capacity and capability to deliver new research programmes.

d) Increased the number, quality and range of peer-reviewed publications in leading journals.

e) Contributed to capacity building to deliver training of ECRs, contract researchers, and research staff. In the period, postgraduate students completed 91 PhDs, of which 20% were international students,

f) Enhanced the research culture by creating new hubs for research staff and postgraduate students, providing programmes of research seminars and workshops, and by promoting research sabbaticals and international researcher mobility (visiting and hosting).
3. External engagement: The Unit successfully increased its portfolio of external engagements, with greater international reach. It strategically targeted business partners, policy and decision makers, service users and providers, and government agencies; as well as research partners from academia and business including visiting scholars and professors, alumni and honorary staff. These engagements contributed to the development, delivery and dissemination of research in the period responding directly to national and international priorities (e.g., health care acquired infection, Reilly).

b.3 Future research plans and strategy: Working towards 2020 the main objectives of the Unit are:
1. To bring the span of the Unit and its research together under a common unifying theme and central research hub facility entitled, *'The Centre for Living'*, and within that centre conduct research that continues to underpin GCU's social mission *'For the Common Good'*, thereby improving quality of life and reducing health inequalities in our national and international constituencies.
2. To strengthen our research activities within the *'Centre for Living'* around the two major research programmes, by:
a) Making strategic investment in the *'Centre for Living'* including the central hub facility, infrastructure and equipment, and people.
b) Strategically focusing on external grant funding, business engagement and philanthropic activity to drive large-scale international projects (e.g., in Horizon2020).
c) Exploiting new global opportunities afforded by research cooperation through the Yunus Centre and GCU's Grameen Caledonian College of Nursing in Dhaka, Bangladesh, and campuses in London and New York.
d) Strengthening our external engagement activities with service users and carers and service providers (REF3b) to remain agile, responsive and proactive towards national and international health and well-being policy initiatives.
e) Continuing to invest in research capacity and capability development in key disciplines and academic subject areas, increasing our Graduate School partnerships, implementing new Academic Leadership programmes, and extending activity within our Peer Review College and Caledonian Research Excellence Development Opportunities (CREDO).
f) Continuing to develop and implement the Unit's 2020 '*Impact Roadmap*', extending reach and deepening the significance of the Unit's research to our main beneficiaries and constituencies (REF3a).
The Unit's research will continue to focus on: **a)** Making fundamental discoveries of mechanisms of disease and associated impairments and disabilities in conditions of high disease burden and cost. It will focus on our major areas of capability in diabetes, arthritis, stroke and ageing. It will also strategically align to demographic and disease trends and national and international health and Science, Technology, Engineering and Mathematics (STEM) initiatives and priorities, and **b)** Developing and testing of novel interventions for individuals, families and communities that are more anticipatory, preventative, personalised and participatory. Similarly, it will concentrate on the integration of health and social care focusing on interventions delivered closer to home or in the community in targeted groups and communities, particularly amongst the hard to reach where health inequalities often have most impact.

b.4 Research programmes and research groups

b.4.1 Managing and Living with Long-Term Conditions

1. Diabetes and Biomedical Sciences: This group contributes fundamental bench based science defining molecular mechanisms of disease with an evolving thematic focus on complications associated with diabetes and obesity. The group is developing interdisciplinary links with other research groups including, 'Infection Prevention and Control' and 'Musculoskeletal Rehabilitation' (e.g. mechanisms of foot ulceration).
Operation and activities: Research is funded by industry (Pfizer, Unilever, Zealand Pharma),

major UK charities (ARUK, BHF, BSF, Cunningham Trust, CSO, Fight for Sight, Diabetes UK, Heart Research UK, Medical Research Scotland, Tenovus Scotland) and EC FP7. Research funding expenditure in period: £2,977,809.
Main achievements: Key contributions to cellular signalling, trafficking and communication which are central to molecular approaches to managing major health risks associated with diabetes. These include internationally competitive studies relating to hypertension and vascular disease (Dempsie[1-4] [ECR], Graham[1-4]), insulin sensitivity (Patterson[1] [ECR]), innovative work concerning retinopathies (Shu[1-4]), fundamental work concerning risks associated with porcine products (Scobie[2,4]) and ground breaking work concerning their relation to xenotransplantation (Xenoislet, EC FP7- £427K, Scobie) as underpinning studies leading to innovative diabetes care. Explorations of skin biology have revealed novel regulatory mechanisms influencing sweat production (Bovel[1-4]), the innate immune response (Martin[1,2], Lang[2,4]) and world leading work concerned with delayed wound closure associated with diabetes (Martin[34], Wright[1] [ECR]), leading to the generation of a GCU Skin Tissue Bank.

2. Applied Vision Research: This group conducts fundamental and applied research focusing on the human visual system and is developing an increasingly interdisciplinary approach.
Operation and Activities: Research is funded by CSO, British College of Optometrists, Fight for Sight, and Allergan Inc. Research funding expenditure in period: £1,265,394.
Main achievements: Anterior eye research (Tomlinson[1-3]) has helped shape the international dry eye research agenda through a number of clinical trials on therapeutic regimens (Allergan Inc) with complementary research providing new insights in corneal structure in health and disease (ECR-Jonuscheit[1]). Fundamental investigations into face, motion, shape and colour perception (Gordon[1-3], Kennedy[1-4], Loffler[1-4], Logvinenko[1-3], Manahilov[1-3], Orbach[1-2], Simmers[1-3]) make excellent translational use of the group's combination of clinical expertise and research skills in visual psychophysics and the cortical mechanisms involved in the accommodation response (Strang[1-4], Day[1-3]). Strong multidisciplinary links with NHS practitioners allow the investigation of clinical populations (amblyopia, myopia, migraine [Manahilov[4]], and dyslexia), assessing the effectiveness of a new treatment for a common visual condition amblyopia (Simmers[4]) and investigating the prenatal and early postnatal effects on the visual system (McCulloch[1-4]). Work by Shu[1,4] illustrates interdisciplinary connection with 'Diabetes and Biomedical Sciences' researchers.

3. Musculoskeletal Rehabilitation: This group is concerned with the epidemiology, underlying disease mechanisms and treatment of musculoskeletal and neuromuscular disease.
Operation and activities: Research is funded by the EC, Arthritis Research UK, European League Against Rheumatism, and Tenovus Scotland. Research funding expenditure in period: £746,885
Main achievements: Significant international contributions have been made towards evaluating complex rehabilitation interventions for knee osteoarthritis (Steultjens[1-2]), multiple sclerosis (Steultjens[3]) and juvenile idiopathic arthritis (Hendry[1-2]). Large-scale cohorts (CHECK, Framingham) have been analysed, identifying new risk factors in chronic musculoskeletal disease (Steultjens[4], Riskowski[1-4]). By coordinating the €5.3M EC-funded *A-FOOTPRINT* project, the group is world leading in the additive manufacturing (3D printing) of personalised foot orthoses and novel orthotic therapeutics (Barn[3], Telfer[1-3] [ECR], Woodburn[2]). It has developed multi-segmented 3D gait-based models of the foot and ankle and combined these with medical imaging (ultrasound, MRI) in arthritis (Turner[1-2], Hendry[1-2] [ECR], Barn[1,2,4], Woodburn[1,3]) and diabetes (Woodburn[4]), identifying modifiable risk factors for poor outcome. This group has new links with 'Diabetes and Biomedical Sciences' to investigate mechanisms and treatment of foot ulceration in diabetes in line with forward strategy (e.g. Woodburn[4], Martin[2], and Wright[1]).

3. Stroke Rehabilitation: This interdisciplinary group seeks to improve *life after stroke* for stroke survivors and their families, deploying a range of methods including evidence synthesis, service user involvement, and designing and evaluating novel person-centred complex interventions through clinical trials.
Operation and Activities: Research is funded by CSO, Stroke Association, and NIHR. Research funding expenditure in period: £663,641.
Main achievements: Major advances in stroke care through systematic review concerning carotid endarterectomy for asymptomatic stenosis (Godwin[4]); identification of research priorities for and

views on rehabilitation through novel stroke service user engagement methods (Pollock[1], Brady[1]) – including those with communication difficulties (Dickson[1-2]); a major national clinical trial on spasticity management (van Wijck[1]); gold-standard evidence syntheses summarising current best evidence for interventions aimed at improving longer-term unmet rehabilitation needs, including communication, cognition, vision and physical recovery (Brady[2-3], Pollock[2-3], van Wijck[2-3]); methodological innovations through systematic review developments (skewed data meta-analysis), secondary data analysis, ethical inclusion of people with aphasia, complex intervention methodologies (stepped wedge cluster RCT), recommendations for screening, minimum datasets, outcome measures, service design and record linkage (Ali[1-4], van Wijck[4,] Donaldson[4]). There are growing links with 'Diabetes and Biomedical Sciences' researchers evidenced through Dempsie's[1-4] work on vascular disease.

b.4.2 Promoting and Protecting Health and Wellbeing

1. Healthy Ageing: This interdisciplinary group investigates the causes, impacts and societal issues associated with aging; and develop and evaluate interventions to improve healthy ageing.
Activities and operation: Research is funded by MRC, Scottish Government, NIHR, and the EC. Research funding expenditure in period: £3,460,956.
Main achievements: Significant and sustained contributions to a holistic understanding of healthy ageing. Foci include: sedentary behaviour (Understanding Sedentary Behaviour, MRC- £997k, Skelton); instability (Skelton[1-,4], Howe[1-4]); incontinence (bladder and bowel dysfunction); exercise interventions delivered through general practice (Skelton, NIHR); world leading trials in prevention and management of pelvic organ prolapse in later life (POPPY Trial, CSO Scottish government Hagen[2,3], and the PREVPROL Trial, Wellbeing of Women, Hagen[1]). There have been key interventions concerning urinary incontinence in both females (OPAL Trial, NIHR, £1.97m) and males following prostate surgery (MAPS Trial, NIHR HTA- £1.5m, Hagen[4]); contributions to understanding adjustment to cancer in later life (Kidd[1] [ECR]); treatments of breast cancer (Godwin[1-3]) and an MRC award concerning end of life care ('Societal values of end of life treatment' £322k, Baker).

2. Anticipatory Care: This interdisciplinary group has a dual focus which a) seeks to prevent the negative consequences of a range of health behaviours and b) maximises service provision through innovative methodological approaches.
Activities and operation: Research is funded by the MRC, EPSRC, NIHR, the CSO and NHS Scotland. Research funding expenditure in period: £1,583,432.
Main achievements: Major advances in parenting and family support, including interventions for parents of children (e.g., Sanders[1-2], £565k Triple P across five years), those with early onset conduct disorders (Sanders[3]) and childhood obesity (Sanders[4]); Biomedical approaches which address the iatrogenic risks associated with gene therapy treatment for monogenic disorders (Scobie[3]) and the risks associated with stem cell targeted drug delivery for childhood leukaemia (Scobie[1]); the role and impact of health assets and social capital on the health and wellbeing of children and adolescents (Morgan[1-4]) and the impact of parental alcohol consumption on childhood mental ability (Emslie[1]) and in mid-life (Emslie[2]); understanding underlying mechanisms of physical activity (Stansfield[1-4]); psychological aspects of sporting activity (McCarthy[1-4]); the prevalence of intellectual disabilities (Finalyson[3-4]) and understanding patterns of sedentary and physical activity across their lifespan (Finalyson[3-4]); groundbreaking health economic and methodological work which applies economic evaluation frameworks to NHS priority setting challenges; and developing methods to explore and quantify the preferences and values of patients and populations with respect to health service provision (Baker[1-4]; Donaldson[1-3]; Mason[1-2], Pinto Prades[1-4]).

3. Infection Prevention and Control: This emerging interdisciplinary group reduces infection transmission through basic science, intervention research, and policy and practice initiatives.
Activities and operation: Research is funded by industry (Wyeth, Astellas, Pfizer), Australian Research Council, CSO, NHS and EC. Research funding expenditure in period: £520,896.
Main achievements: An international contribution through a programme of methicillin-resistant staphylococcus aureus (MRSA) prevalence, transmission, screening, and hospital admissions studies, including a randomised controlled trial of the effectiveness of two hand hygiene protocols in

reducing bacterial hand contamination (Reilly[1-2]). This work is underpinned by cutting edge bench science examining the effects of Telavancin on MRSA biofilms (Lang[1-3]). Epidemiological and psychosocial work has shaped the policy agenda for blood borne viruses, for example, developing a world leading Hepatitis Strategy in Scotland, influencing Hepatitis C and HIV policy and practice across Europe (Hutcheson[1-4], Goldberg[1-3] and, Flowers[1-3]) and shaping public health responses to pandemic influenza (Flowers[4]).

c. People:

c.1 Staffing strategy and staff development

c.1.1 Staffing strategy: The Unit's staffing strategy aims to develop sustainable research groups with critical mass, relevant expertise and the capabilities to deliver the Unit's research objectives. It achieved this by:
a) Aligning staff from across the span of the Unit to relevant research groups, recognising cross-group/programmatic contributions.
b) Investing in new staff at all levels to establish complementary areas of research, to support emerging themes with strong potential or to achieve critical mass in well-established groups.
c) Providing the necessary staff training, mentorship and professional development to enable researchers to successfully contribute to the research programmes.
d) Providing robust performance review with rewards and equal opportunities for career advancement and progression.
e) Committing to support inward and international outward mobility of staff to gain new skills and broaden experiences, and to establish new or strengthen existing collaborations.

c.1.2 Supporting career development of researchers (including clinical researchers): The Unit provides equal training opportunities for non-clinical and clinical researchers with generic and transferable skills training available across all stages of career progression:
a) CREDO was launched in 2011 to support career development of all established researchers. It draws on the expertise of the Unit's research leaders and invited external speakers to deliver a programme of training workshops that include *'Developing pathways to impact in research grant applications'*, *'Fostering research collaboration'*, *'Capturing the impact of your research'*, and *'Research leadership and mentoring'*. CREDO has also led to the development of a *Research Leadership Programme* which promotes the development of leadership, mentoring and communication skills. GCU has recently been awarded the HR Excellence in Research Award by the European Commission in recognition of our adherence to the principles of the European Charter for Researchers and the Code of Conduct for their recruitment.
b) Performance and Development Annual Review (PDAR) and Promotions Round processes: Researchers have a designated line manager and undergo biannual performance development and review. This enables clear and realistic objectives to be set and reviewed, for appropriate resources and support to be committed, and for staff development plans to be created and supported. £130k has been invested in staff development activities in the period. Researchers are eligible to participate in, and have been highly successful in annual promotions rounds (see c.1.5).
c) Career development is also enhanced through a rich and vibrant programme of IAHR seminars, workshops, and master classes with national and international contributors (£46k in period). The new School of Health and Life Sciences policy promotes research-based sabbaticals to enable staff to develop new concepts and hypotheses, to undertake pilot work, or to travel to work with international collaborative centres and groups (e.g., Barn to University of Amsterdam). Researchers are supported in their routine research work by dedicated teams of laboratory technicians and the professional services of research administrators in Departments of Research, Innovation and Enterprise, Marketing, and Finance.

c.1.3 Supporting equality and diversity: Diversity and equality is promoted in all aspects of the recruitment and career management for researchers and doctoral students. The last staff survey found that staff agreed that the Unit 'respected people of different sexual orientation (95%), ethnicity/nationality (95%), disability (95%), gender (93%), religion (97%) and age (90%)'. The Unit subscribes to the University's overarching *Equality and Diversity Policy* and *Equality Outcomes Framework*; which sets out a series of actions around improving culture, environment and

knowledge, and outlines who is responsible for delivery and how we will monitor and measure progress. To maintain momentum the Unit will appoint an Equality and Diversity Champion whose remit is to further develop an action plan which promotes a culture of dignity, respect and equality within the Unit. Moreover, the Unit subscribes to the Athena SWAN Charter and has made a commitment to address any gender inequalities, tackle unequal representation of women in STEM and take a proactive approach to ensuring organisational culture, policies and practices to support gender equality. Feedback from Athena SWAN suggests that GCU has the foundations of a Bronze recognition award and we will be submitting an application in April 2014. Commitment to equality and diversity is evidenced by many women in senior roles. Data show an increase of women in science within the Unit.

c.1.4 Integration of clinical academics and practitioners: Clinical academics underpin the Unit's commitment to ensuring that questions from practice (clinical practice and academic practice) drive research. The Unit has strategically forged links with partners in the NHS, industry and third sector by recruiting clinical professors (including Reilly, Goldberg), promoting secondments to the NHS for all research staff (for example Turner, Woodburn), and offering honorary appointments (six honorary Chairs, two honorary senior lecturers and 16 additional honorary appointments). Clinicians are located within the research programmes, have key roles in strategic planning and management, and enjoy full use of the Unit's infrastructure and resources.

c.1.5 Sustainable staff structures: Within the Unit, the IAHR Director and Associate Dean Research work closely with research programme and thematic research leads to develop and implement staff resourcing and succession planning. These plans are incorporated and implemented through the School of Health and Life Sciences Senior Management Group, with Unit representation through the IAHR Director. In the REF period there has been significant staff investment which has driven critical mass and sustainability across the Unit's research programmes. This includes the addition of two Readers; eight ECRs (Dempsie, Hendry, Jonuscheit, Kidd, Mason, Patterson, Telfer, and Wright), two senior lecturers (Emslie, Shu); and four lecturers.
Internal promotions have rewarded significant achievement in the period and strengthened capacity (eight Chairs: Baker, Graham, Skelton, Simmers, Steultjens, Godwin, Strang, and van Wijck), four Readers, five senior research fellows, one research fellow, 15 senior lecturers and five lecturers).
Across the Unit £44k of pump priming supplemented with support for staff to conduct post-graduate work aligned with research programmes (17 part time PhDs and 12 Professional Doctorates) has enabled new researchers to emerge from significant teaching roles or part-time research posts. Furthermore, the administration and management of the Unit's activities, including public engagement, has also been boosted by the appointment of IAHR support staff (one Clerical Assistant, one Senior Research Administrator), a 'Service User and Carer Co-ordinator', a 'Research and Community Communications Officer', and a 'Community and Public Engagement Co-ordinator'.

c.1.6 Development of early career researchers: Development of ECRs is undertaken jointly with the Graduate School guided by the *'The Concordat to Support the Career Development of Researchers'.* ECRs have full access to Graduate School and CREDO training programmes (see c.1.2 and c.2). ECRs are assigned a line manager, usually a principal investigator, and they participate in the PDAR process (see c.1.2). In 2011, a bridging fund was created to support ECRs between periods of grant funding or during transfer to employment.

c. 2 Research students
Doctoral research training across the Unit is organised and delivered through the Graduate School. The School was rated by students as the 1st Graduate School in Scotland for 2009 and 2010 and is rated 2nd out of the 74 participating universities worldwide in 2010 (IBarometer student survey). The Graduate School won the Times Higher Education 2010 Award for Outstanding Support for Early Career Researchers. GCU was instrumental in the creation of the Scottish Researchers Career Coordination Forum (SRCCF) (2009 to present) and currently convenes it. The SRCCF is a national collaboration of Scottish Universities, SFC, and Universities Scotland for the support and development of researchers in their research careers in Scotland in accordance with the UK Research Concordat. GCU is newly elected convenor (2013 – 2016) of the Universities Scotland

Research Training Sub-committee which focuses on the development of strategy, policy and planning in the area of research development, providing advice to Universities Scotland and Scottish Funding Council. GCU continues from 2011 to 2013 to have excellent overall satisfaction ratings from research students of 90% (PRES surveys). The 2013 CROS and PIRLS survey results show that the percentage of staff participating in regular staff appraisals is consistently above UK averages, with 90% for researcher leaders (UK 82%) and 64% for research contract staff (UK 60%). Across the Unit doctoral students have access to a variety of resources, workshops and guidance to develop and enhance research, and hone generic and transferable research skills. Structured around the Vitae 'Researcher Development Framework', the Graduate School provides:

1. Workshops and events across a range of training designed to enhance student development, employability and the identification of future career pathways.
2. Support and training for writing skills.
3. Specialist support for international doctoral researchers for whom English is not their first language, with one-to-one tuition provided from an experienced Lecturer in Academic Writing.
4. Wider training and support for research development including a series of courses to improve knowledge base, cognitive abilities and creativity, peer-to-peer coaching workshops and 'how to be an effective researcher', support through induction sessions, registration and performance review.
Doctoral students are represented within the Unit's research governance structures. They develop and participate in seminar series and workshops and schemes such as the Magnusson Award and Santander Fellowships promote international mobility and personal development. Overall completion rates for the Unit's Doctoral work have risen to 73% for full time within four years and, within six years, to 100% for part time (both above the national average), reflecting improvements to doctoral supervision, governance and support.

d. Income, infrastructure and facilities

d.1 Research income: Research income awarded to the Unit has grown from an average of £1,428,885 per annum during the RAE2008 census period to £2,870,968 for 2007-2013. Moreover, an average annual awarded income of £1,868,607 has recently risen to £7,882,774 within 2012-13. External grant expenditure for the Unit totals £11,219,014; an increase of 12.2% in comparison to RAE2008, and the total value of grants awarded is £16,007,974. Furthermore, the proportion of funding from leading sources including Research Councils UK (MRC, ESRC and EPSRC), The Wellcome Trust and the EC has increased, as has the continued support from major medical charities, trusts and industry.

d.2 Research infrastructure and facilities:

d.2.1 Physical space and facilities: There has been considerable investment in physical space, and facilities (£2.9m) across the Unit including:
a) Central hub for the IAHR and associated support staff (£888k).
b) Hosting the Yunus Centre and NMAHPRU (£976k).
c) Refurbishment of the Human Performance and the Advanced Molecular Science Laboratories supporting new studies across both research programmes (£1.1m).
d) Redesign of accommodation to create separate PhD student and research fellow hubs.

d.2.2 External equipment grants and donations: External grants from Arthritis Research UK totalling £90k have funded state-of-the-art gait analysis and diagnostic ultrasound equipment. In conjunction with grant support from Tenovus Scotland, the Unit developed a new Orthotic Innovation Centre based around new capacity and capabilities in orthotic 3D printing. £385k of equipment has been donated (Optos, Nidek, Optical express and Topcon) to provide the Applied Vision Research Group with advanced optical measurement techniques.

d.2.3 Library and digital infrastructure: The Unit shares the GCU Library which subscribes to key academic content in over 30,000 full-text journals, giving access to 35,000,000 peer reviewed journal articles from publishers and services including APA, BMJ, CUP, Elsevier, Emerald, IEEE, Jstor, OUP, Sage, Taylor & Francis and Wiley. 47% (£1.6m) of the library budget is spent on information provision, 84% of this spend is on access to electronic content (SCONUL mean for

2012/13 is 77%). We were early adopters of EThOS (Electronic Theses Online Service) and have more than 300 PhD theses digitised and freely available for download. Since 2007/08 our users have downloaded over a million articles every year and in 2012/13 over a million ebook chapters. Investment of £96k in the PURE research information system, the Digital Commons Repository (£75k) and Research Professional funding search tool (£52.5k) has significantly improved the Unit's governance and management of its funding and research activity.

d.2.4 Innovation centres, networks and shared external infrastructure: In 2013 the Unit became a partner in the Scottish Funding Council £10m Digital Health and Care Innovation Centre. This provides national infrastructure and funding to engage more closely with business and will be fundamental to supporting the Unit's research in response to health and population trends and rebalance of care away from hospitals. The Unit has played a key role in the Scottish Government funded Glasgow Research Partnership in Engineering (£400k) involving GCU and the Universities of Glasgow and Strathclyde to establish a critical mass of research excellence in bioengineering and rehabilitation engineering in the West of Scotland.
The Unit's partner status with Glasgow Biomedicine provides researchers access to the expertise and facilities of the Glasgow Clinical Research Facility, the Glasgow Bio-repository and the Safe-haven for data. Researchers across the Unit collaborate with Clinical Trials Units nationally. Collectively these resources are necessary to support the large-scale clinical trials and related studies that are in progress or planned. The Unit, through the NMAHPRU leads the *Virtual* International Stroke Trials Archive (VISTA) Rehabilitation trials repository in collaboration with University of Glasgow; partners with Universities of Dundee, St Andrew's, Stirling and Aberdeen in a Scottish Improvement Science Collaboration Centre Consortium.

d.2.5 Research governance: The higher level strategic objectives and performance management of the Unit are governed by the University Research Committee chaired by the Vice-Principal and Pro Vice-Chancellor for Research. The Unit is represented by the Director of the IAHR (Woodburn), the School of Health and Life Sciences Associate Dean for Research (Flowers) and the Director of the Yunus Centre (Donaldson). The Unit's research is operationally managed by the IAHR Steering Committee with representation from research programme and thematic group leads. The Unit works closely with Directors from Academic Research Development and the Graduate School to develop academic quality and development strategy. The Unit's 2020 research strategy has been developed to respond to the incremental growth within the research programmes and includes wider public and stakeholder involvement at all levels of the Unit's governance.

e. Collaboration and contribution to the discipline or research base

e.1 Contributions to the discipline and wider influence: Key accolades reflect the Units standing and leadership within the national and international research arena, reflected by an extensive portfolio of:

e.1.1 Invited keynote and plenary presentations (key examples): The European League against Rheumatism (EULAR) Annual Congress, Madrid (Hendry, 2013); International Liver Congress 2014 (Hutchinson); the International Symposium on Falls Prevention (Skelton, 2012); International Society on Priorities in Health Care, Vancouver (Donaldson, 2012); The 9th International Symposium of Ophthalmology, Guangzhou China (Shu, 2013); the World Congress in Genodermatology (Martin, 2010); the World Congress of Podiatry (Woodburn, 2013); Orientation and Briefing on Triple P, Manila, the Philippines, for WHO (Sanders, 2011); International Aphasia Rehabilitation Conference, the Hague, the Netherlands (Brady).

e.1.2 National and international committees (key examples): Membership of the Steering Committee of the International Coalition for Active Aging (Skelton); Arthritis Research UK: Research and Academic Capacity Committee (Woodburn); Honorary President, Canadian Psychological Association 2009 (Sanders); International Society for the Scientific Study of Subjectivity – ISSSS (Baker); Invitations to discuss Hepatitis C at the World Health Assembly, WHO, The White House and the European Parliament (Goldberg). Chair of the Policy Development Group of Health Behaviour in School-Aged Children (Morgan); deputy Chair of Glasgow City of Science (Howe); RAE2008; REF2014 panel member (Howe); Science and Engineering Research

Council Measuring Machines Advisory Group (Godwin); Member of technical advisory group for WHO Guidelines on Screening, Care and Treatment of Hepatitis C (Hutchinson); Chair of Methodology Group SIGN (Howe).

e.2 Participation in peer-review (key examples): Academy of Finland (Skelton); Advisor to Arthritis Research UK Clinical Study Group on Osteoarthritis and Crystal Disease (Steultjens), Musculoskeletal Pain (Woodburn), and Fellowships Implementation Committee (Woodburn); British Skin Foundation Large Grant Advisory Panel (Martin); College of Optometrists Research Committee (Strang); Commonwealth Games; Research Legacy Consortium Working Party (Skelton); CSO Research Advisory Committee (Baker); CSO Research Grants (Brady); Health Services and Population Health Research Committee (Howe, Hutchinson); CSO doctoral and post-doctoral studentship awards panel (Hagen); CSO Biomedical and Therapeutic Research Committee (Goldberg); Department of Health Policy Research Unit Panel (Donaldson, Deputy Chair); Genome Canada's GE3LS (Genomics and its Ethical, Environmental, Economic, Legal and Social Aspects) Projects Assessment Panel (Donaldson); MRC Health Economics Post-Doctoral Award Panel (Chair, Donaldson); MRC Methodology Research Panel (Donaldson); NIHR Efficacy and Mechanism Evaluation Programme College of Experts (Godwin); NIHR Programme Grants (Steultjens); The Netherlands Organisation for Health Research and Development (ZonMw), Netherlands (Brady); Sight Loss and Vision Priority Setting Partnership (PSP) (Simmers); Society for Research in Rehabilitation Council member (van Wijck); UK Health Protection Agency Research and Development Fund (Hutchinson); Visual Research Trust (Strang).

e.3 Research Council peer review (key examples): Australian Research Council (Flowers, Sanders); BBSRC (Graham, Loffler, Manahilov, Martin, Shu, Strang); EPSRC (Loffler, Logvinenko); ESRC Peer Review College (Flowers); Medical Research Council (Brady, Manahilov, Flowers, Graham, Hutchinson, Lang, Martin, Sanders, Shu, Simmers, Woodburn); New Zealand Health Research Council (Flowers, Sanders, Skelton); The Wellcome Trust (Graham, Manahilov, Martin, Simmers).

e.4 Editorial Boards and Journal editorship (key examples): Equally, the Unit's esteem is reflected within its representation upon many Editorial Boards signifying the stature of Unit staff within their respective professions, disciplines and academic subjects. These include: Advances in Medicine (Shu); American Journal of Biomedical Research (Shu); Biochemical Journal (Martin); Clinical Biomechanics (Woodburn); Clinical Child and Family Psychology Review (Sanders); Clinical Science (Graham); Cloning & Transgenes (Shu); Cochrane Review Group (Musculoskeletal-Howe; Stroke- Brady, Pollock, and van Wijck; and wounds- Brady); Contact Lens and Anterior Eye (Tomlinson); F1000 (Dempsie); Gait and Posture (Stansfield), Health Economics (Pinto Prades); Health: an Interdisciplinary Journal (Flowers); Health Policy (Donaldson); Journal of Child and Family Studies (Sanders); Journal of Foot and Ankle Research (Woodburn, Steultjens); Pharmacology Research and Perspectives (Dempsie); New Journal of Science (Shu); Ocular Surface Journal (Tomlinson); Operant Subjectivity (Baker); Psychology & Sexuality (Flowers); Social Business (Donaldson); Stroke Matters (Brady); The Open Rehabilitation Journal (Brady). Staff within the Unit also hold *Journal editorships,* for example, Assistant Editor of 'Addiction' (Hutchinson); Associate Editor 'Journal of Aging and Physical Activity' (Skelton); Past Editor and current Associate Editor, 'Behaviour Change' (Sanders); Editorial Board and subsequently Associate Editor of Health Economics (Donaldson); Associate Editor, Social Business (Donaldson); and Associate Editor, BMC Musculoskeletal Disorders (Woodburn).

e.5 Fellowships and relevant awards: These include:

e.5.1 Fellowships: EC Marie Curie International Outgoing Fellowship, 2013-15 (Telfer); Arthritis Research UK Allied Health Professional Training Fellowship 2008-2011 (Barn, £162k); ESRC Postdoctoral Fellowship (Mason, £121k); National Institute for Health Research, Inaugural Senior Investigator (Donaldson, £15k pa); National Institute of Health T-32 Harvard-wide Translational Research in Aging Training Program Fellowship, 2010-2012, Boston, USA (Riskowski, £97k); Fellowship from the Royal College of Optometrists (Kennedy, £27.5k; Day, £29k).

e.5.2 Awards and accolades (key examples): Member of the Royal Society of Edinburgh Young Academy of Scotland (Hutchinson); Academician of the Academy of Social Sciences (Flowers); Droitwich Lecture, British Health Professionals in Rheumatology (Woodburn 2009); The Marjory Carpenter Lecture, EXTEND Annual General Meeting (Skelton 2010); Member and councillor, International Society for Contact Lens research (Tomlinson); Society for Social Medicine (Godwin). Awards include the Neil Charman Medal for Outstanding Research- College of Optometrists Research Excellence Awards 2011 (Day), the European Monitoring Centre for Drugs & Drug Addiction Scientific Paper Award (Hutchinson); Dorothy Mandelstam Award 2011 awarded by the Association for Continence Advice (Brady and colleagues); Arthritis Research UK Silver Medal Prize 2010 (Hendry 2011 and Barn 2012); the American Orthopaedic Foot and Ankle Society Roger Mann Award (Woodburn); and oral presentations prize, International Xenotransplantation Society Congress, Minneapolis, USA (Scobie).

e.6 Effective academic collaboration (key examples): Strategic collaborations have been formed with national and international partners that service to expand the major research programmes as well as building capacity and capability across the Unit. EC consortia are a key example where the Unit has focused on wider participation involving academia and SME and large industry partners (ProFouND- Skelton, TRIAD- Scobie, and AFOOTPRINT- Woodburn). The Unit's expertise has successfully built collaborations through research mentorship (National Institutes of Health (NIH) 'K' award mentorship, Washington University in St Louis School of Medicine- Woodburn). Enduring collaborations are established through grant funded activity, visiting professorships and fellowships, and, increasingly, network activity. Key examples include Monash University and the University of New South Wales in the area of infectious disease (Flowers[4]); York University, Canada and the University of Western Australia in the investigation of shape/face processing (Loffler[2]); whilst Visiting Professorships for Robert Hess (McGill University, Canada) and Peter Bex (Schepens Institute, Harvard University, USA) strengthen the Applied Vision Research Group; and for networks the Collaboration of Aphasia Trialists (21 countries), developed by Brady and Ali, broadens the reach of the Stroke Rehabilitation Research Group.

e.7 Integration with external bodies (key examples): The Unit invests in strategic partnerships that strengthen the research base and disciplines across the research programme. In the period, a major strategic partnership has been established with HPS. This has ensured that the Unit's research undertaken meets more closely the needs of HPS and its Stakeholders (including Government and NHS Boards). Further that it is disseminated through the relevant National and International Health Protection Networks, and that it critically translates into evidence-based public health policy and practice. Goldberg for example is generating a framework for the control and prevention of Hepatitis B and C in the EU/EEA on behalf of the European Centre for Disease Control Taskforce (Goldberg[2,3]). Integration with external bodies through committee and chairperson activity include, for example, Glasgow Biomedicine; (Steultjens); National Co-ordinating Centre for NHS Research and Delivery (Reilly); NICE Guidelines Programme (Godwin); Associate Director, Centre for Public Health Excellence, NICE (Morgan); Ministerial Appointments for the National Sexual Health & HIV Advisory Committee - (Flowers, Goldberg); Expert Consultant on Positive Parenting, Council of Europe (Sanders); Advisory Committee on the Sexual Health and Blood Borne Virus Framework (Goldberg, Hutchinson) and in industry, Martin is a member of Gap Junction advisory committee, Zealand Pharma, Denmark.

e.8 Effective mechanisms to promote collaborative research: The Unit has established mechanisms to promote collaborative research. These include an annual budget of £25k to enable staff to participate in conferences, workshops and seminars of strategic importance to the research programmes; to support institute seminars and workshops that bring existing or potential collaborators on campus; to support research sabbaticals in new or established centres with named experts or groups that can contribute to growth in research excellence, in particular through grant funded project development; and support for visiting lecturers, fellows and professors. Pump-priming funds (£5-10k) are available for small-scale projects that demonstrate strong collaborative opportunities and meet research objectives.