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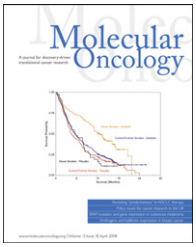

Science Policy

Cancer research in the UK: A policy review of the junior academic clinical faculty

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ABSTRACT

Despite huge sums spent on academic clinical raining worldwide there is surprisingly little research to inform policymakers. This study addresses the junior faculty in the UK's cancer research community through both current Fellows and senior clinicians and policymakers. Funding organisations under the National Cancer Research Institute umbrella currently support 176 junior faculty fellows (studying towards MD [2 year postgraduate research degree] or PhD) with the majority in medical oncology (49%). Craft specialities (surgery and pathology) had a very modest presence in the junior faculty. The cancer research specific junior faculty makes up a major component of all available junior faculty from National Cancer Research Institute (NCRI) partners (ca. 31%) and is supported both by direct funding to Fellows and via junior faculty positions on clinical programme grants. There was almost universal support for the value of the research experience despite only two thirds of the current cohort expressing a desire to continue to the next level (Clinician Scientist grade). Major issues identified were mentorship, supervision time, pay parity and fit with new UK Clinical Research Collaboration / Modernising Medical Careers (UKCRC/MMC) clinician training programme.

1. Introduction

Despite many publications on the issues facing academic medicine (Stewart, 2002) there is a dearth of data on the numbers, type and progression of clinical academics at all levels. Indeed this situation is true for many countries, not just the UK. Exceptions to this in the UK include the 2004 CHMS survey and the recent BMA Cohort Study of 1995 Medical Graduates. However, such surveys have been relatively low resolution. What has not been available is disease specific data on clinical academics. Set against this background it was clear that the UK's National Cancer Research Institute (NCRI) needed to assess future trends in cancer research through the capture long-term data on clinical training.

In light of the UK Clinical Research Collaboration/Modernising Medical Careers (UKCRC/MMC) initiatives in academic training the lack of comparable data in disease specific areas should be of serious concern. The complex nature of academic training in the UK is well reflected in the numerous parties that are involved at varying levels, from the multiplicity of

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funding organisations (e.g. charitable funders such as Wellcome Trust, Cancer Research UK) through to the Royal Colleges and National Health Service/University bodies. In such an environment where there are complex and diverse responsibilities there is a clear need for the UK wide collection of academic training and career progression data within a controlled informatics framework. Without this, current and future interventions will continue to suffer from the deficiencies of opinion-based policy making. This study was designed to start the process of addressing these policy gaps in the area of cancer research.

2. Methodology

Semi-structured interviews were conducted with UK senior academic cancer research clinicians ($n = 38$) and a focus group of current junior faculty (clinicians undertaking a period of research leading to the award of a higher degree —either MD [2 year post medical qualification research degree] or PhD; synonymous terms include *Clinical Research Training Fellow*). Additional interviews (face-to-face) were carried out with senior administration of major UK biomedical charities and Royal Colleges ($n = 14$).

In addition an 'open' Likert scale questionnaire was developed and validated to study the qualitative aspects of junior faculty training.

- A total of 82 current junior faculty fellows (for the rest of this article these will simply be referred to as *Fellows*) were contacted to participate in the survey. Fellows who recently (<6 months) completed their junior faculty training were included. Seventy-eight responses were received.
- The questionnaire was created using an existing validated template. The topics covered by the questions were chosen to reflect issues of importance to Fellows and policy makers. Following an internal validation process the questionnaire was distributed for external validation. It was made available to a small number of randomly chosen Fellows, and to members of the Cancer Research UK Training and Career Development Board.
- Many of the responses to the questionnaire were designed using a Likert scale for attitude measurement. A Likert scale measures the extent to which a person agrees or disagrees with a question or statement.

The second questionnaire was a nationwide survey of Fellows working in cancer research under the umbrella of the NCRI.

- Twenty-eight funding organisations were approached. Only organisations with a history of funding Fellows and a peer-review process for awarding fellowships were approached.
- The data were collected via a postal survey, integrated into an Excel database and funding attributes assigned to individual funders.

3. Results

3.1. *Junior faculty in UK cancer research*

All 28 of the UK funding organisations approached responded to the survey, giving a 100% response rate. Fifteen of the 28 organisations approached provide support for a total of 176 cancer research Fellows. CRUK is the largest funder of cancer research Fellows, providing support for 45% of the total number of Fellows in post. The other major funders of cancer research Fellows are the Leukaemia Research Fund (13%), the Medical Research Council (10%), the Department of Health (7%), and Breakthrough Breast Cancer (6%). Of the available junior faculty posts the charitable sector supported some 69% of the total (Figure 1).

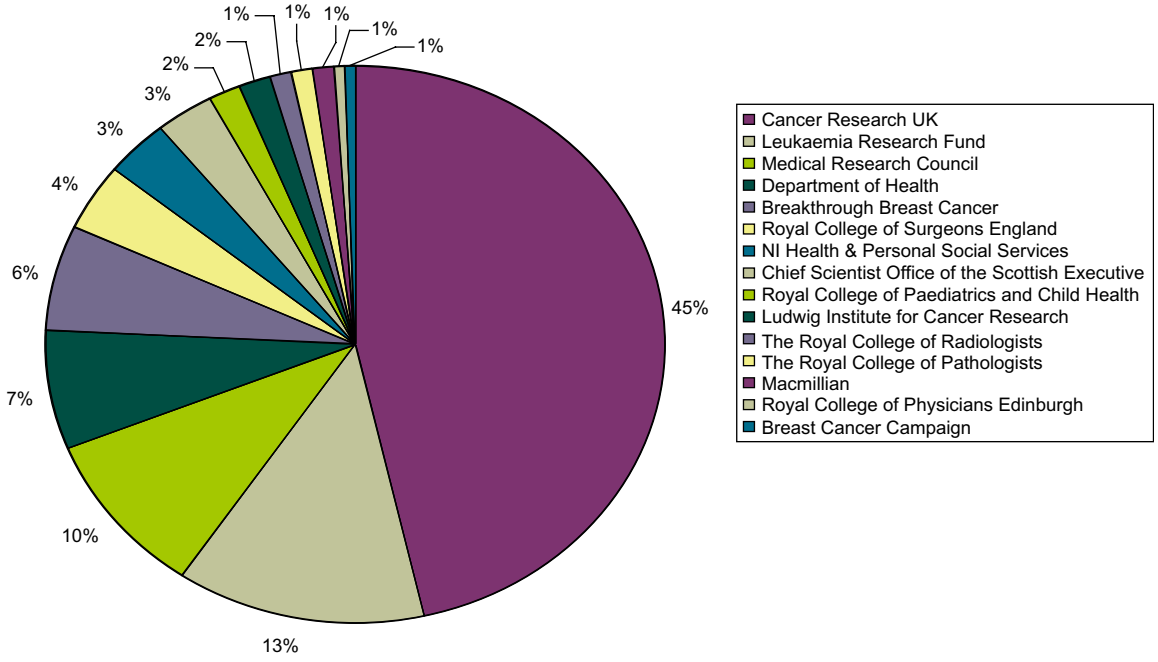

Figure 1 – Funding organisations supporting junior faculty in cancer research. % of overall spend.

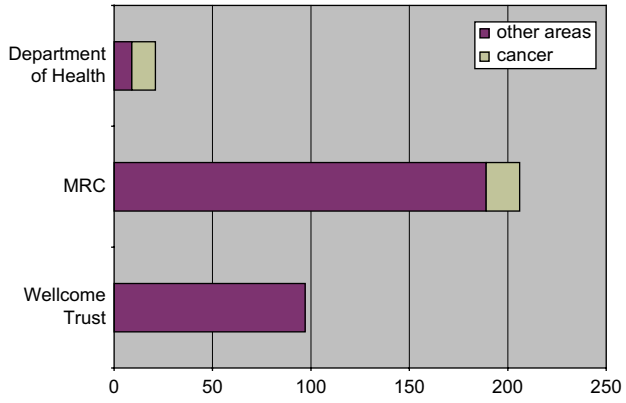

Figure 2 – The total number of junior faculty funded by the Department of Health (England), MRC and Wellcome Trust with cancer research specific Fellows shown.

Without an understanding of the total number of clinical research training Fellows in the UK it is impossible to come to a conclusion as to whether or not there are 'enough' cancer-specific Fellows. In order to address this question the three major funders of non disease specific Fellows the Wellcome Trust, the Department of Health and the governmental Medical Research Council (MRC) were asked to provide data on all of their available junior faculty posts.

Between them the Wellcome Trust, Department of Health and MRC provide funding for approximately 320 Fellows, of which approximately 30 are working in cancer research (Figure 2).

If the Fellows supported by CRUK and the Leukaemia Research Fund are included in this analysis the figures change considerably. Together the five funding organisations support 430 Fellows, of which 31% work in cancer research.

The survey identified cancer-specific Fellows in 23 locations across the UK. One third of the CRTFs were located in London, with Oxford (13%), Southampton (13%), Birmingham (12%), Leeds (10%) and Edinburgh (10%) being well represented.

3.2. *The disciplines of cancer research junior faculty*

The survey identified Fellows from 16 different medical disciplines working in cancer research (Figure 3). Medical oncologists dominate, comprising 49% of the current posts. The second largest discipline represented was surgery at 12%, immediately followed by clinical oncology at 11%. The representation from pathology and paediatric oncology was on a par with that from nursing, at 6%, 5% and 6% respectively, while other disciplines such as obstetrics and gynaecology, psychology, and public health each made up 1% of the Fellows in cancer research.

Cancer research Fellows are available either as a competitively won grants awarded directly to the clinical fellow or embedded in a larger research programme awarded competitively to the chief investigator. Most funding organisations award only competitively won cancer research fellowships directly to the Fellow with only CRUK, Breakthrough Breast Cancer and the Ludwig Institute for Cancer Research funding cancer research Fellows via programmatic awards (Figure 4).

3.3. *Experience of Fellows and Clinical Directors to UK junior faculty training*

Fifty-six Fellows (68.3% of the sample) returned their questionnaires. The response rate for Clinical Directors was 62.5%.

The Fellows all provided details of their specialties. Medical oncologists made up over a third of all respondents (37%), followed by clinical oncologists and urologists (both 14%).

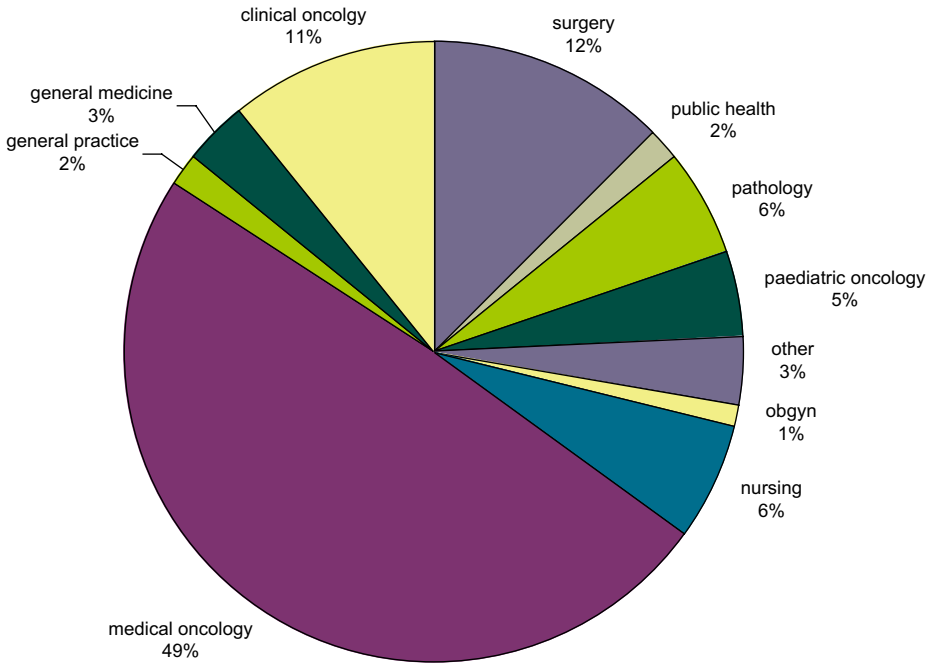

Figure 3 – The medical disciplines of cancer research junior faculty supported by NCRI funders.

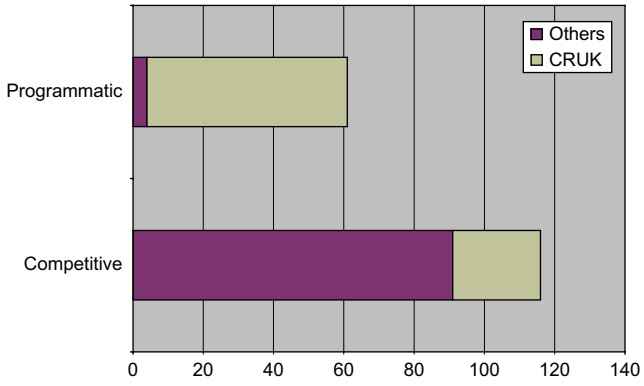

Figure 4 – Total number of junior faculty in cancer research supported directly or through programme grants to senior principle investigators.

Thirteen clinical specialties were represented in the sample of respondents.

For most Fellows the attraction of undertaking an academic fellowship had been either an inherent interest or clinical role model. For male Fellows, almost half (48%) cited an interest in a topic area as their primary reason for undertaking an PhD/MD whereas the greatest proportion (29%) of female Fellows felt that completing a PhD/MD was necessary for career progression (Figure 5).

Both the fellows and clinical directors were asked if they thought UK junior faculty training schemes were a 'good research training experience'. Eighty-eight per cent of clinical directors and 96% of fellows either strongly agreed or agreed with this statement.

Fellows were asked about their plans for the future. Almost 50% hoped to continue with an academic research career after further clinical training, while 18% intended to apply for a clinician scientist position immediately upon completing their doctoral work. However, a third of the fellows intended to leave academic medicine permanently upon completion of their higher degree (Figure 6).

Amongst those who intended to leave academic medicine, the most commonly cited reason for this was a perceived lack of job security (29%) followed by not viewing themselves as career academics (25%).

For comparison, this same topic was covered in the questionnaire sent to clinical directors. The clinical directors responded that, in their view, the primary reason why clinical fellows would not want to continue with academic research was because the clinical fellows did not see themselves as career academics (23%). However, 14% of the clinical directors ticked the 'other' category in response to this question. Individual responses for this question included 'competition for jobs' and 'a lack of career opportunities/structure'.

Fifty-eight per cent of the clinical directors who responded to the questionnaire strongly agreed that clinical fellows need more support from their supervisors. There was a significant divergence of opinion amongst the clinical directors on the issue of whether clinical fellows would benefit from mentoring by an independent clinical supervisor. Forty-seven per cent of the clinical directors agreed or strongly agreed that Fellows would benefit from access to non-supervisory mentors and just over 40% disagreed.

At the start of their fellowships, almost all the clinical fellows felt they lacked the necessary skills (this included scientific skills as well as presentation, public communication, and writing skills) to undertake their projects.

Despite a number of sacrifices (top two were fear of deskilling and drop in pay, 43% and 48% respectively) that the Fellows who intended to stay in academic medicine envisaged for their future, their experiences to date had been very positive with fewer than 5% saying that they would not study for an MD/PhD if they had their time over again.

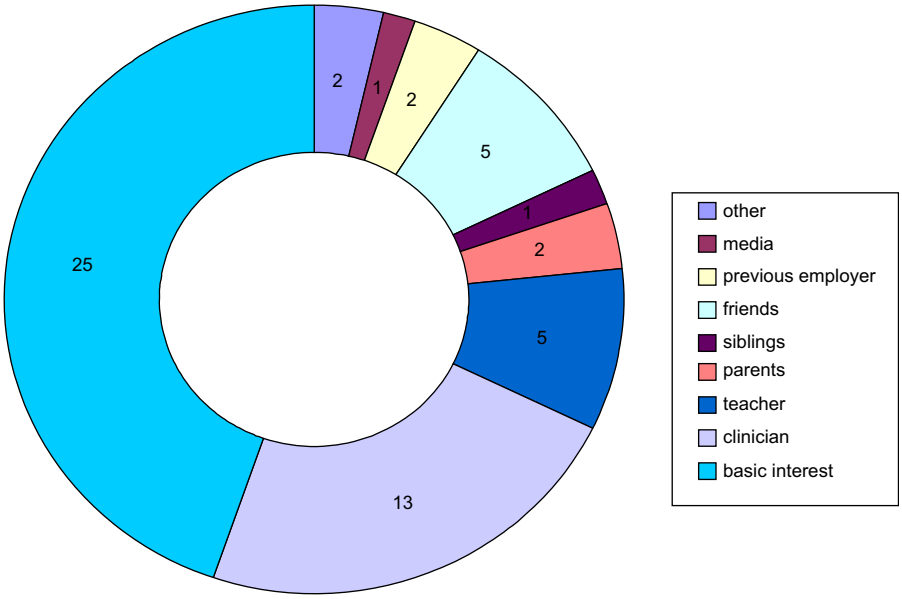

Figure 5 – Reasons given by Fellows for undertaking a junior faculty training position in cancer research.

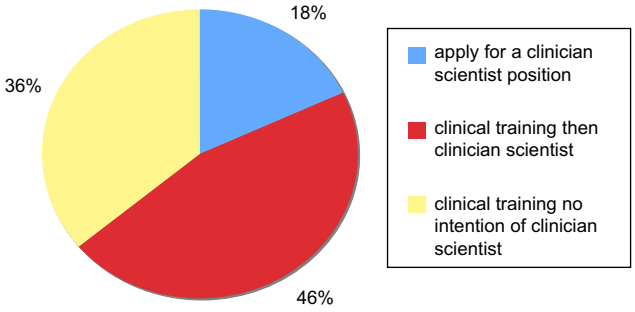

Figure 6 – Aspirations of cancer research junior faculty for the future.

4. Discussion

The 2004 UK Council of Heads of Medical Schools survey found that there were some 906 fellows undertaking an MD/PhD in all medical disciplines (Silke, 2004). Our data indicate that cancer research junior faculty is a substantial, if not the majority disease specific arena for junior academic clinicians in the UK. In addition to the junior faculty identified by our research through NCRI partners, numerous Fellows are also being funded from other sources, e.g. other non-NCRI charities, *ad hoc* industry positions, and institutional 'soft' monies that are not captured in our figures.

One of the notable findings is the still large numbers of junior faculty training towards a two year MD (a higher degree course that is almost unique to the UK). There has been substantial debate over the utility of MD compared to a PhD. Whilst the majority of Fellows complete a PhD (83%) there remains strong justification, particularly from clinicians within the 'craft' specialities (e.g. surgery) to retain the option of an MD. No evidence was found of any output bias between MD or PhD from a small cohort study of Fellows looking at impact factors and numbers of publications (data not shown).

Our data suggest that around a third of current all Fellows in cancer research will depart academic training after the completion of their MD or PhD. An argument could be forwarded that this essentially wastes the funders' money and therefore a mechanism should be developed to reduce this number by either a pre-fellowship triage or encouraging more of these Fellows to continue. However, we found that it was by no means clear that this was indeed a 'waste'; many viewed the completion of MD or PhD as essential for the modern world of oncology service delivery and furthermore it inculcated greater 'research mindedness' into the clinician who would later be more likely to contribute in the broader sense to cancer research. If the argument that it is allowing too many clinicians to undertake a MD or PhD who are not going to progress to Clinician-Scientist is accepted then that the options are either to raise the hurdle of entry, e.g. by making more or all junior faculty positions very competitive, or to offer alternatives to the MD/PhD route. The problem with the former approach is that it is highly unlikely to work. A sub-analysis of the cadre of Fellows who expressed a desire to stay or leave academic training found no difference in the mechanism that funded their fellowship. The latter approach may be more fruitful.

Should funding organisations (e.g. Medical Research Council) only support Junior Faculty through direct awards to fellows rather than as part of core programmatic resourcing to clinical units or institutes? Two arguments could be forwarded as to why funding organisations should only support the Fellows directly. Firstly as a statement of overall equity, i.e. no one clinical director or host institution can 'gift' these Fellowships. The other argument has been made on grounds that Fellows from the directly competitive route are of higher standards than core programmatic. The latter has been reviewed using bibliometric outputs of two groups of recently departed/3rd year Fellows.[2] No significant difference was found. In the context of the wider UK academic training changes the move to training accounts had already been recommended by the UKCRC/MMC and already certain funders, e.g. CRUK and British Heart Foundation, are moving in that direction.

If the arguments for continuing to support junior faculty through core funding to clinical units and institutes is accepted then a question is raised as to why all Fellows are not funded this way. Indeed analysis reveals this would be highly cost effective. The problem with removing all competitive schemes is that (a) certain orphan disciplines would no longer be supported as there are no core units with certain themes, e.g. nursing, and (b) analysis of the location/source of the generic competitive Fellows indicate that they capture individuals who are not rotating through major clinical research centres and who would thus be otherwise lost to the system if it were not for this 'safety net'.

MD-PhD programmes are running on a modest scale at three Universities in the UK—GKT, Imperial and Cambridge (CHMS/CHDDS, 2007)—and are now explicitly recognised within the current UKCRC/MMC model for academic clinical training. These schemes have not been running for a sufficient length of time to have undergone formal evaluation. Furthermore, we found little enthusiasm among the junior faculty focus group meetings, and senior academic directors expressed serious reservations behind funding such schemes, particularly as at this stage no decision had been taken on a prospective medical career.

Finally, the clinical training pathway has changed substantially with the implementation of Modernising Medical Careers.[3] The academic pathway has been derived from a joint UKCRC/MMC working party with input from Postgraduate Medical Education and Training Board.[4] The key issues for both Fellows and clinical directors were flexibility of funding (with junior faculty support open from higher training [ST1 onwards—this equates roughly to Residency period in the USA system] into consultant period), bridging support after the junior faculty years to prepare for Clinician-Scientist applications, and full support for running expenses in addition

[2] $n = 6$ each group. Analysis for number of publications and their impact carried out by Professor G. Lewison, City University.

[3] This implemented the 2000 Government pledge to reform the SHO grade. Unfinished business—Proposals for the reform of the SHO grade. September 2002.

[4] PMETB is the independent statutory body, responsible for overseeing and promoting the development of postgraduate medical education and training for all specialties, including general practice, across the UK.

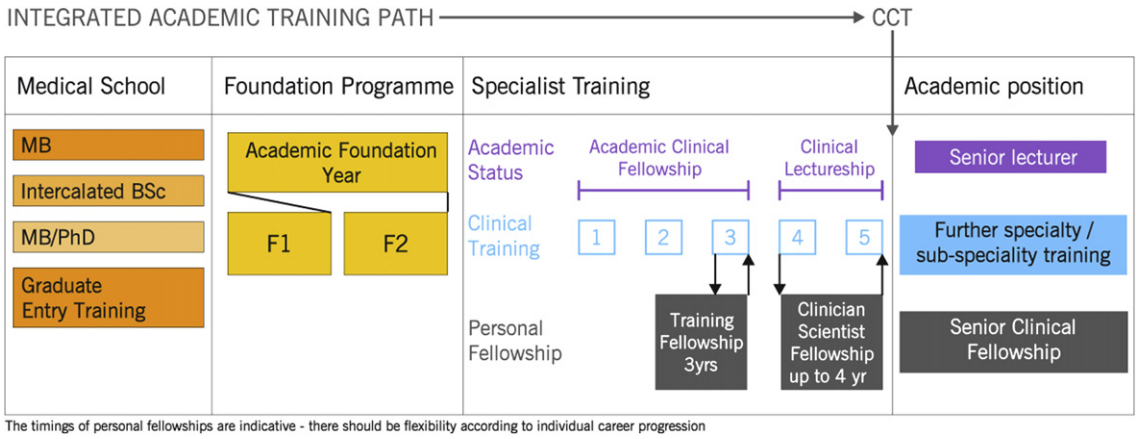

Figure 7 – New academic training path in the UK.

to the personal fellowship support at 11 programmed activities level (Figure 7).

4.1. *Academic junior faculty outside the UK*

In the USA in 1995 a broad-based analysis of clinical research careers was undertaken by the Institute of Medicine (1994). Personnel studies specific to oncology investigation also have been conducted (Freireich, 1991; Bleyer, 1996). The litany of recommendations ensuing from these reviews will be all too familiar to those concerned about the fate of academic medicine. These reports have repeatedly documented a continuing decrease in the number of young investigators entering academic careers in clinical research. They cite the prolonged training of clinical investigators, accumulated debt, the financial insecurity of embarking on an academic clinical research career, and the perceived slow academic advancement of role models in clinical research as key disincentives to pursuing a clinical research career.

Most comprehensive cancer centres have their own in-house academic training programmes. An independent review by the NCI found the Johns Hopkins Graduate Training program to be a model programme that met the need for education in research methodologies, provided for mentored clinical research and an opportunity for original clinical investigation. In addition, the Institutional Training Grant (T32) mechanism of NIH has been seen as a viable means for training the physician scientist although the duration of support was considered to be too short for the clinician.

The NIH mechanisms for postdoctoral training for physicians have traditionally occurred through the K series awards, which require a varying amount of research experience. These awards, specifically the KO8 and K12 awards, provide a protected period of research training for clinical investigators. Mid-career awards are also provided through K24 grants. Currently the Office of Extramural Research provides over 30 distinct 'clinical training' awards through a bewildering variety of schemes (http://grants.nih.gov/grants/guide/search_results.htm?scope=parfa&year=active&text_curr=clinical+training). The numbers and/or disciplines of clinicians-in-training in the USA is not known. As such it is very hard to estimate overall spend; however, the Office for Extramural Research core training budget for clinicians (including National Research Service Awards) in the last fiscal year on record was $136 million. The NIH Office for Extramural Research provides a K-grant wizard which has proved to very popular with prospective and current clinical academics.[5]

Training fellowships from trans-European organisations remain very limited,[6] although the European Organisation for the Research and Treatment of Cancer (EORTC) provides a number of potentially worthwhile clinical trial courses open to all Member States. UICC provides a number of short Fellowships (up to one year) for cancer clinicians, public health/epidemiology and nursing. However, numbers are limited and the majority of these are awarded to Developing World countries. The EU also provides training opportunities through its Marie Curie Actions (http://europa.eu.int/comm/research/fp6/mariecurie-actions/action/stage_en.html) that can be used by prospective clinicians at Clinical-Scientist stage to work in another EU country. However, in practice there are few of these, and they are highly competitive.

The majority of UK Fellows and Clinical Directors in our policy research felt that a period of research outside the UK was highly beneficial—particularly the BTA 'Been to America' badge. However, it was almost universally felt that a PhD junior faculty position should not be undertaken abroad. Rather, the real opportunity was seen for those at the middle and senior levels. Most of the funding provision for junior faculty in cancer research was felt to be of a comparable or higher standard in comparison to many other countries, particularly the substantial number of training positions that were available in the UK system.

4.2. *Discipline and site specific issues for junior faculty*

Our research considered the needs, gaps and opportunities of academic training to produce a cadre of research active clinicians in a wide range of site-specific cancers. There is little data on the coverage of any one site speciality in terms of

[5] http://grants.nih.gov/training/careerdevelopmentawards.htm should be read in conjunction with the CTEP training and funding opportunities guide.

[6] Currently only one Fellowship restricted to French citizens.

research interest. Unsurprisingly the best surrogate for reviewing this was the level of spend according to the NCRI Common Scientific Outline (O'Toole et al., 2003). Many areas were considered to be well served by research active clinicians including breast, colorectal, paediatric, gynaecological and haematological oncology. Some orphan areas were identified—particularly lung cancer. As part of the NCRI strategic review of lung cancer the issue of clinical academic workforce training was reviewed. This highlighted the difficulty of thinking about clinical academic training in this manner. Whilst it was true that there were very few clinicians at the middle or senior faculty level specifically studying lung cancer, and indeed a number of highly qualified academic clinicians who treated lung cancer were engaged in different research projects, the numbers of clinical trial active clinicians in lung cancer had been substantially rising (Richards et al., 2006).

We also considered the needs of individual domains of cancer research. Five areas are provided below by way of example. However, many of those we interviewed (>76%) felt that this issue could not be reviewed in isolation from non-clinical training needs or strategic reviews of these domains of research as a whole.

a. *Early phase clinical trials (Phase-I-ology)*: Many of the Clinical Directors noted that post PhD most middle and senior faculty were focused on more basic laboratory work; however, a more in-depth analysis of the current UK cohort found that over half were or had been involved in Phase I/II clinical trials. One specific area was consistently highlighted—the need for more clinicians specifically trained in pharmacology.
b. *Late phase clinical trials (Phase IV)*: Responses from individual members of NCRI Clinical Study Groups indicated a general trend of bringing in clinicians to run trials and a 'learning by doing' approach. It was noted that skill sets differed depending on what aspect of trial design, conduct and management was being considered. Broad skill sets and training were highly applicable to many clinicians (from medical oncologists to academic GPs) whilst more specialised statistical training required formal routes through MSc or PhD.
c. *Translational research (non-Phase I/II)*: The specific domain identified by a number clinical directors was targeted training in methodologies around the design and conduct of biomarker studies (diagnostic, prognostic, predictive) both from the development stage (analytical and clinical validity) to the more complex clinical utility assessments.
d. *Psychosocial* and *Behavioural*: In common with other domains some critical issues were highlighted particularly around training in complex methodologies and interventions. Whilst it was recognised that there were very few groups in the UK who were capable of providing this, training opportunities were highlighted through two recent NCRI initiatives—in prevention (NPRI) and supportive & palliative care (SuPaC)—and through specific courses on quality-of-life methodologies that were offered as part of taught MSc.

With over 50% of UK junior faculty currently in medical oncology and with the majority of the academic Chairs occupied by medical oncologists, no specific overall issues were identified in this discipline. Turning to clinical oncology, whilst it was felt that there had been significant problems over the last decade (Illidge, 1998), there was now clear proof of improvement in terms of training opportunities and numbers of junior faculty in the system. In particular the recent UK radiobiology initiatives around joint College of Radiology funding, the Oxford development as well as a renewed interest in radiobiology (driven in part by the interest in combining the newer 'targeted' therapies with radiation) and the technological innovations around radiotherapy delivery (IMRT, novel imaging—dceRI, BOLD, CT/PET, etc.) have all added to make this a much more attractive academic area. A further positive was the enhanced profile of academic training within the Royal College of Radiologists. Whilst this area had not reached sufficient momentum to be self-driven, many of the issues raised in the past were starting to be addressed (Gerrard et al., 1998).

Turning to the 'craft specialities' in cancer research, the numbers of academic pathologists has been rapidly diminishing over the last ten years due to a variety of factors. Set against this is a real need and renewed interest in this area in the context of molecular pathology in cancer. Furthermore, there are a number of substantive academic pathology Chairs across the country embedded in major centres of cancer research with the necessary infrastructure and environment for academic pathology to flourish. This research identified the need for targeted Molecular Pathology Training Programmes in the UK cancer research community.

The situation for academic surgical oncology has also been particularly precarious. As well as interviews with current surgical faculty a major one-day workshop with the academic surgical community was also undertaken. Academic training in surgery *per se* is under major threat and has been well documented in a Consensus Statement from the academic surgical bodies which was convened by Sir David Carter (ASGBI, 2004). Whilst surgeons were active within the clinical trial networks there was a serious concern about the lack of fully academic cancer surgeons in training and the sufficient number of academic environments that would allow them to flourish. The latter was viewed as particularly important in the sense that the service delivery environment would need to be specifically tailored around the academic surgeon (Neal et al., 2005). Many of the Clinical Directors had already recognised the importance of putting surgical trainees through junior faculty but, as many of them indicated and the evidence shows, these individuals then drop off the radar and do not progress to middle and senior academic faculty posts.

A number of other disciplines were also reviewed: nursing, primary care, psychosocial oncology and behavioural science. One recurrent theme throughout all these areas was how little research activity was being undertaken as a whole and particularly compared to other areas of cancer research. Part of the problem may lie in the lack of knowledge amongst potential applicants of the schemes available from UK funding organisations. The major evidence for this conclusion came from a workshop on primary care that was held in 2005. Many academic GPs with an interest in

cancer research were simply unaware of the training schemes and/or funding opportunities in this area. Indeed this 'knowledge gap' was a recurrent theme and points to the need for funding organisations to clearly spell out opportunities for funding, particularly in these orphan areas.

4.3. *Public policy issues for UK's junior cancer research faculty*

The health and success of junior faculty in the UK is ultimately dependent on the state of service delivery in any one cancer discipline or geographical location. Indeed since Calman–Hine this is one of the major factors that govern the long-term health of the UK's clinical research portfolio (Calman and Hine, 1995).

As part of our research, this issue was discussed with the respective Royal Colleges and devolved Health Departments. Whilst 'high-level' data were available there was a staggering lack of high quality, high resolution data in many cancer-relevant specialities. Notable exceptions in medical and clinical oncology (Board of Faculty of Clinical Oncology, 1998) were overshadowed by the tremendous uncertainties in modelling data on projected manpower requirements. In addition certain specialities, e.g. surgery, believed that the implementation of the European Working Time Directive would have an even more deleterious effect on academic surgery by cutting back the ability to put in extra operative hours in addition to the research time. Some attempts by Devolved Health Departments to address this (Scottish Executive, 2005) have been forthcoming but no systematic assessment for cancer as a whole has been made.

A more intangible issue was the whole issue of the 'academic culture'. Since Calman–Hine in 1995 there have been over seven major reports on the decline and fall of academic medicine in the UK, culminating in the UKCRC/MMC work. In taking stock of the 'Green Guide' (AMRC/COPMeD, 2000) which overviews all the different bodies responsible in some way for the career of an academic clinician, it is clear that there are too many and often competing parts to feel secure about the future. One of the universal messages from both current junior faculty and clinical directors was a call for a more positive research culture in the National Health Service and joined-up thinking between those responsible for supporting academic medicine. The recent hugely problematic restructuring of medical training in the UK (the MMC programme) is a particularly egregious example of both evidence-free policy-making and a failure to join up thinking when it comes to academic medicine.

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