Response to Stereotactic Radiosurgery and Radiotherapy Services – needs assessment and service review by NHS England from the Institute of Physics and Engineering in Medicine (IPEM)

Stereotactic radiotherapy is delivered by a multi-disciplinary professional team composed of Surgeons, Clinical Oncologists, Radiographers and Medical Physics staff. The professional body for medical physicists, clinical engineers and clinical technologists in the UK is the IPEM, on whose behalf this response is made.

By law, under the Ionising Radiation Medical Exposure Regulations 2000 (IRMER2000), Medical Physics Experts (MPEs) must be closely involved in every therapeutic medical exposure. The MPE must be contracted full-time to the radiation employer and available at all times in Radiotherapy practices[1]. Thus MPEs take a full part in the design and optimisation of stereotactic treatment plans.

In addition physics involvement in radiotherapy includes:

i) advice on procurement;
ii) radiation protection advice and critical examination;
iii) acceptance testing and technical commissioning of equipment;
iv) responsibility for and management of the quality assurance programme;
v) acceptance, commissioning and configuration of the treatment planning system and associated software;
vi) development of standard operating procedures;
vii) routine service support.

We welcome the recent review of stereotactic radiotherapy services as an opportunity to improve access to high quality and effective services. Clearer commissioning of stereotactic services will allow effective business planning, drive innovation in centres of excellence and ensure continuity of funding nationwide. However, we are concerned about a number of the statements made in the report, as described below.

(i) NHS England's preferred approach is to commission SRS/SRT services that are available for patients seven days a week, in line with plans for other NHS services, rather than just Monday to Friday. Do you agree with this approach?

Seven day working is presented as a way to increase capacity, based on the assumption that when machines treat patients 5 days a week they are idle for '29% of the week'. A recent report by IPEM found that on average, 600 hours per linac per year are required for quality assurance (QA), servicing, maintenance, research and development[2]. This equates to 12 hours per week, or 1.5 standard days (9am-5pm). For complex plans such as SRS/SRT, there is also a requirement for patient specific QA, which further decreases the machine idle time. In many centres these critical activities, upon which patient safety depends, are already performed outside 'standard' patient treatment hours (including weekends).
In addition, the consultation document does not take into account the cost of staffing and supporting a radiotherapy service seven days a week. It is easy to assume that the large capital cost of treatment machines will dominate any cost-effectiveness model, but SRS/SRT is a complex treatment requiring the immediate availability of the whole multidisciplinary team, including the Medical Physics Expert (MPE). Any increase in service provision to cover a 7-day week must include scientific, technical, medical, nursing and A&C staff in addition to the radiography treatment staff. This will require a

[1] Medical and Dental Guidance Notes. IPEM, 2002.
[2] The Impact of Extended Clinical Hours on a Radiotherapy Physics Service. IPEM, 2014.

proportional increase in staff to cover the extra days, which will necessitate extra funding. Manufacturers also need time to adjust to a seven day service model, and associated support by estates and maintenance staff, which is particularly important when most centres do not have a backup machine of the same type. These factors do not appear to have been considered in this review.

(ii) There is some uncertainty about how quickly the use of SRS/SRT treatments will become more common. If clinical practice changes gradually, a growth rate of 12.5% per year has been forecast. NHS England's clinical policies are based on widening access to treatment, so, if clinical practice moves more rapidly, to match these policies, a growth rate of 27% per year has been forecast. If, however, in the future, NHS England were to changes its policies, a growth rate of 35% per year for seven years has been forecast.
NHS England's preferred approach is to base plans for the level of use on the 27% per year growth rate, which is based on the treatments that will be required under NHS England's existing clinical commissioning policies. Do you agree with planning for this level of demand?

Given concerns over the additional staffing and infrastructure costs required to support these plans, Scenario A would seem to be the more pragmatic approach, which could be revised as and when further data become available. Whichever growth level is planned for, the requisite workforce plans will need to be adjusted to support the additional activity.

IPEM has serious concerns about the shortage of qualified Clinical Scientists and Technologists in NHS radiotherapy services. We believe that current training arrangements for technologists and the number of commissioned training places for medical physicists are inadequate to meet future workforce demand, arising partly as a result of increased use of complex treatments such as SRS/SRT. This problem needs to be addressed urgently as part of the process of planning major expansion in the use of these treatments. IPEM has written to the Chief Scientific Officer of NHS England to highlight these concerns and to suggest possible solutions.

(iii) If you do not agree with Option 2, the preferred option, do you agree with any of the remaining options for change?

Some departments already work extended working hours over five days for routine treatments, which is closest to option 1, with additional essential activities taking place 'out-of-hours' as described above.

However, we have major concerns about some of the assumptions presented in the report for all four options, as described in detail elsewhere:

- There is no consideration of the cost of staffing these options.
- The capacity of Cyberknife and linac based services appear to be greatly underestimated.
- The demand data are not robust due to the historic difficulty of funding these treatments, prior to the establishment of the current commissioning policies.

There is also growing evidence for the use multi-fraction stereotactic treatment rather than single fraction treatments[3,4]. The increased use of more versatile, non-invasive systems such as CyberKnife and stereotactic-capable linacs rather than GammaKnife means that the ratio of SRT to SRS treatments is likely to change dramatically over the coming years. Along with the increased use of focal radiotherapy compared with whole brain radiotherapy, this means that that the average number of treatments per patient will increase. Modelling these effects alongside the expected number of patients could change the expected demand considerably. Therefore, decreasing the number of commissioned treatment units, as all four models suggest, could lead to a shortage of resources in the near future once these trends have become apparent.

(iv)The use of machines that are dedicated to delivering SRS/SRT (such as Gamma Knife® and CyberKnife®) does mean ensuring that a large enough population catchment to ensure it is economic

[3] Choi CY et al. Stereotactic radiosurgery of cranial nonvestibular schwannomas: results of single- and multisession radiosurgery. Neurosurgery. 2011; 68: 1200-8.
[4] Hansasuta A et al. Multisession stereotactic radiosurgery for vestibular schwannomas: single-institution experience with 383 cases. Neurosurgery. 2011; 69: 1200-9.

to provide the machines. On the other hand, use of a LINAC means that SRS/SRT can be combined with other radiotherapy treatments and offered on a part-time basis. The review did not find evidence to suggest that one type of machine achieves better outcomes than another.
Do you agree that a mixture of Gamma Knife®, linear accelerators and CyberKnife® machines should be used to provide SRS/SRT services commissioned by NHS England?

Yes, but with the following caveats:

i) The modelling of service supply relies heavily on the assumption of treating 3.5 patients per day on GammaKnife units, and 2.5 patients per day on CyberKnife and stereotactic capable linacs. However, no justification is given for the values, or evidence to support them. A recent survey of stereotactic body radiotherapy (SABR) found an average treatment time of 30 mins per fraction[5], or 16 patients per standard day on a linac, if the radiation delivery were the sole factor involved in these treatments. However the number of patients will be limited by the localisation, outlining and planning time, which is also independent of number of fractions. Treatment of SRS/SRT on a Cyberknife takes on average 45-60 minutes, therefore the capacity is certainly greater than 2.5 per day. Based on the experience of a number of UK centres, at least 5 and perhaps as many as 10 could be treated per 8-hour working day (if the workforce planning was in place).

ii) Tomotherapy centres are listed as potential providers in the appendices, but it is stated in table 1 that these machines do not deliver SRS. At least one UK tomotherapy unit routinely treats SRS.

iii) The Cyberknife, as is acknowledged elsewhere in the consultation documents is capable of treating SBRT as well as SRS/SRT. Both the stereotactic Linac and the CyberKnife are able to deliver image-guided radiotherapy (IGRT) using fractionated treatment courses, utilising non-invasive frameless techniques. Frame-based systems require additional resources on a per-patient basis. Since both types of unit are not usually used full time for brain SRS, this effectively reduces the cost of commissioning a wider geographic spread of facilities. There is much evidence of patients refusing to travel even for more advanced treatment so providing treatment closer to the patient's home should be a consideration.

iv) The number of potential providers listed in the report has been underestimated. 22 current and potential providers in England are identified, compared to a recent survey of SRS services by the radiotherapy physics community, which counted 24 centres that are currently providing this technique or planning to imminently. A further 7 centres are planning to implement the technique in the next 2-3 years, but only one of these is listed in the report, partly because linac-based treatments are mostly restricted to specific models of linac such as Novalis. If all possible centres are included then it will be easier to fill geographical gaps and choose the centres best positioned to provide the service.

(v) Are there any other considerations which need to be taken into account, which have not been covered in the options for change? If so, please tell us what those considerations are, and explain the reasons for your answer.

There is little emphasis on the multi-disciplinary nature of these treatments, which is essential for safe operation. Ideally the MDT (which includes specialist neurology clinical oncologists, neuro-surgeons, neuro-radiologists and makes the decision that the patient should be treated with SRS) should be involved in the whole pathway. The desire of patients to be treated close to home has also been somewhat understated.

(vi) Are there any inequality/health equalities issues which you think should be considered in making a decision about the future commissioning of SRS/SRT services in England? If so, please tell us what these issues are and explain the reasons for your answer.

[5] Distefano G et al. Survey of stereotactic ablative body radiotherapy in the UK by the QA group on behalf of the UK SABR Consortium. Br J Radiol 2014; 87: 20130681.

All options presented in this paper advocate maintenance of or decrease in the number of treatment machines available. Thus, even if 25 machines are located strategically there is still likely to be a large fraction of patients in England that cannot reach an SRS/SRT treatment centre within one hour. This may prove discriminatory to a larger number of patients and converse to objective 8 of this exercise to establish more equitable patient access to advanced radiotherapy.

About IPEM

Physicists, engineers and technologists play vital roles in delivering our healthcare. The Institute of Physics and Engineering in Medicine (IPEM) is the professional organisation that represents this workforce. We are a charity with over 4,000 members from healthcare, academia and industry.

Our members help to ensure that patients are correctly diagnosed and safely treated for illnesses such as cancer and stroke. They also maintain and manage medical equipment such as MRI and ultrasound scanners, X-ray machines, drug delivery systems and patient monitors.
Their research and innovation leads to new technologies and methods that improve on existing medical treatments. They provide new solutions that enable older people and patients with injuries or long-term conditions to complete everyday tasks.

IPEM's objectives are to:

- Ensure and improve the quality, safety and effectiveness of science and technology in healthcare.
- Maintain high standards of professional development for healthcare scientists, engineers and technicians.
- Ensure that the right medical physics and biomedical engineering workforce is in place and provide our members with the support that they need.
- Encourage research and development and increase the uptake of new knowledge and innovations by the medical physics and biomedical engineering sectors.
- Raise the profile of medical physics and biomedical engineering.
- Build two-way engagement with patients and public.

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President, IPEM

Date: …22nd January 2015……