

# Regarding thrombectomy centre volumes and maximising access to thrombectomy services for stroke in England: A modelling study and mechanical thrombectomy for acute ischaemic stroke: An implementation guide for the UK

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Dear Dr Norrving

Re Maximising access to thrombectomy services for stroke in England: a modelling study<sup>1</sup> and Mechanical thrombectomy for acute ischaemic stroke: an implementation guide for the UK<sup>2</sup>

We thank Foo et al. for highlighting a typographical error in our paper<sup>1</sup> and also in our recent online publication “Mechanical thrombectomy for acute ischaemic stroke: an implementation guide for the UK”,<sup>2</sup> namely that the paper by Rinaldo et al.<sup>3</sup> cited relates to a volume of practice over three and a half years not one year.

Regarding Thrombectomy Centre Volumes:

Multiple studies now demonstrate a link between mechanical thrombectomy (MT) centre volumes and outcome, mortality, and complications. A cluster of studies has defined high volume centre as >50 cases per annum.<sup>4–6</sup> From a European perspective this is rather low; many European centres now exceed 300 MT cases per annum and >100 is commonplace (the minority of English Neuroscience centres currently delivering MT 24/7 all exceed that). In prior analyses, annual volumes of <25 were associated with worse outcomes than high volume centres with >50 MT cases. We are not aware of published series examining whether very high volume centres (e.g. >150 per annum) have better outcomes or reduced morbidity-mortality compared with “medium volume” centres (25–50 per annum).

However, when modelling provision of MT services for England (population ~56 million) a desirable minimum centre volume for thrombectomy needed to be set and additional factors were considered as well as clinical outcomes. These included ambulance travel times and minimum volume to sustain 24/7

neurointerventionist rotas. In the UK it is advised such rotas should have a minimum of five operators<sup>7</sup> and we also had to consider published guidance on minimum levels of practice for individual operators.<sup>8,9</sup>

We assumed that a new “standalone” MT centre located based on geographical need should provide a 24/7 service but in the UK it would not undertake cerebral intervention outside of MT. In the UK healthcare environment a rota of five or more operators would be appropriate and all would need to maintain neurointerventional skills based on MT caseload alone. Whereas in the existing 24 English Neuroscience centres, there are large volumes of other cerebral interventions utilising very similar equipment and skills for operators to maintain experience. As national and international guidance assert 36–40 cases per annum is required for cerebral interventional skill maintenance,<sup>8,9</sup> even with achievable levels of “double-scrubbing” (~25%), some 150 MT cases per year would be required for all operators to maintain skills

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from thrombectomy practice within that centre. Capital and maintenance costs of new centres also needed consideration when determining minimum centre volumes in the UK healthcare environment. A new centre with volume >150 was cost saving in the UK healthcare economy.<sup>10</sup> Based on UK circumstances we did not model alternatives to a comprehensive stroke centre (CSC) with drip and ship referrals (such as drip and drive or drip and fly) as these could not be realistically delivered in 3–5 years given our national starting base of staffing and imaging infrastructure.

Considering all these factors, we settled on an expert consensus of 150 per annum for a standalone MT centre as meeting all the necessary requirements of: well-used (optimised) pathway, maintaining skills of team of 5+ operators and support staff, centre volume adequate for good patient outcomes and highly likely to be cost effective.

Therefore we do not accept there is appropriate reason to redefine our model specification<sup>1,2</sup> with regard to CSC MT caseload and would not accept the level of 35 per annum Foo et al. suggest.

Yours sincerely

#### Declaration of competing interests

GAF has received personal remuneration for educational and consultancy work for Bayer, Cerevast, Medtronic, and Pfizer. GAF's institution has received a grant from Medtronic. PMW has received personal remuneration for educational and consultancy work for Microvention and Stryker. PMW's institution has received a grant from Microvention and unrestricted educational grants from Medtronic, Stryker and Penumbra. M James & M Allen – none.

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#### Informed consent

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#### Ethical approval

Not applicable.

#### Guarantor

PMW.

#### Contributorship

All authors contributed to drafting and editing this response and contributed to the original manuscript as described in it.

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