Opportunities and Barriers to Hub-and-Spoke Delivery Models for Advanced Therapy Medicinal Products in Europe: A Scoping Review

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Introduction

- The enhanced patient care required for the successful delivery of ATMPs typically restricts service provision to a limited number of centrally located comprehensive care centres, often limiting patient access.[1] A hub-and-spoke model is a system whereby a series of central expert treatment administration facilities (hubs) are supported in the delivery of long-term care by a network of geographically distributed patient management centres (spokes).[2]
- In the context of ATMPs, hub-and-spoke models have been proposed to address the unique challenges associated with distribution and patient access.[3] The aim of this scoping review was to identify the opportunities for, and barriers to, hub-and-spoke delivery of ATMPs and to develop a framework for wider implementation in Europe.

Methods

- A comprehensive scoping review of the scientific and relevant grey literature published between January 2015 (initial approval of an ATMP in Europe) and May 2023 was conducted.
- A two-stage study selection process was used: (1) title and abstract sift followed by (2) full text review for articles passed during the initial sift. All sifting and screening of search results was conducted by two reviewers.
- Content that discussed factors related to the characteristics and individual barriers to, or opportunities for, the implementation of hub-and-spoke models for ATMPs was extracted verbatim for content and thematic analysis.
- A hub-and-spoke simulation was undertaken for Portugal using a hypothetical CAR-T therapy as a model and an established workflow for oncology care as a base case.

Results

- Bibliographic database searches returned 405 records for title and abstract screening of which 30 were passed for full-text assessment and 21 were selected for inclusion in the review. A combined PRISMA flow diagram is shown in Figure 1.
- Fifteen of the 21 (71%) included publications had a disease-specific focus, with 8 (38%) publications addressing AAV-based gene therapy, 6 (29%) addressing CAR-T therapy and 1 (5%) focusing on hematopoietic stem cell transplantation. Six (29%) papers adopted a disease agnostic perspective addressing ATMPs in general. Publications that referred to a single European pharmaceutical market contributed to 29% (Italy), 14% (UK), 2% (Austria, Germany and Spain) and 1% (Switzerland, Singapore, Sweden, France and Czech Republic) of total knowledge.
- Opportunities identified for hub-and-spoke ATMP delivery models included the use of existing European Reference Networks for rare diseases, multidisciplinary clinical management to simplify the patient experience, effective long-term safety and efficacy surveillance systems, simplified manufacturing and logistics and potential to address current geographical inequity in patient access. Barriers included establishing sustainable funding for necessary infrastructure, potential complications related to cross-border patients, unclear structure and processes to manage complex patient needs and the requirement for specialised knowledge to manufacture, handle and administer ATMPs.
- Descriptive themes pertaining to the functioning of hub-and-spoke models were subsequently abstracted into four overarching analytical themes (Infrastructure, Expertise, Regulatory and Organisation) and used to develop a framework for proposed responsibilities and requirements of hubs and spokes across the patient journey (Figure 2).
- A hypothetical model for Portugal is presented in Figure 3. According to this model, CAR-T therapy is prescribed and administered by expert hubs and longitudinally managed by regional treatment centres (spokes).

Conclusions

- Overall, the articles identified support the hub-and-spoke model as a feasible approach to enhancing patient access to ATMPs in Europe.
- The proposed framework for hub-and-spoke site definition may facilitate the development of decentralised ATMP care delivery models within and across European markets.

Abbreviations:

ATMPs, Advanced Therapy Medicinal Products; AAV, Adeno-associated Viruses; CAR-T, Chimeric Antigen Receptor T Cells; EMA, European Medicines Agency; GDPR, General Data Protection Regulation; HCPs, Healthcare Professionals; UK, United Kingdom.

References:

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2. Elrod JK, Fortenberry JL Jr. The hub-and-spoke organization design revisited: a lifeline for rural hospitals. BMC Health Serv Res. 2017;17(Suppl 4):795.
3. Hermans C, Gruel Y, Frenzel L, Krumb E. How to translate and implement the current science of gene therapy into haemophilia care?. Ther Adv Hematol. 2023;14:20406207221145627.

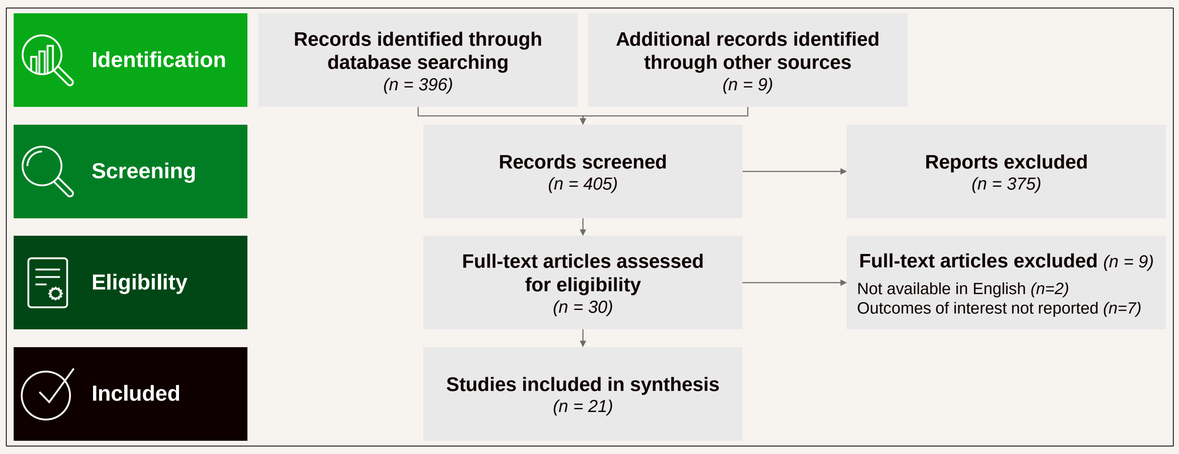

Figure 1. PRISMA diagram of the literature search and inclusion of publications.

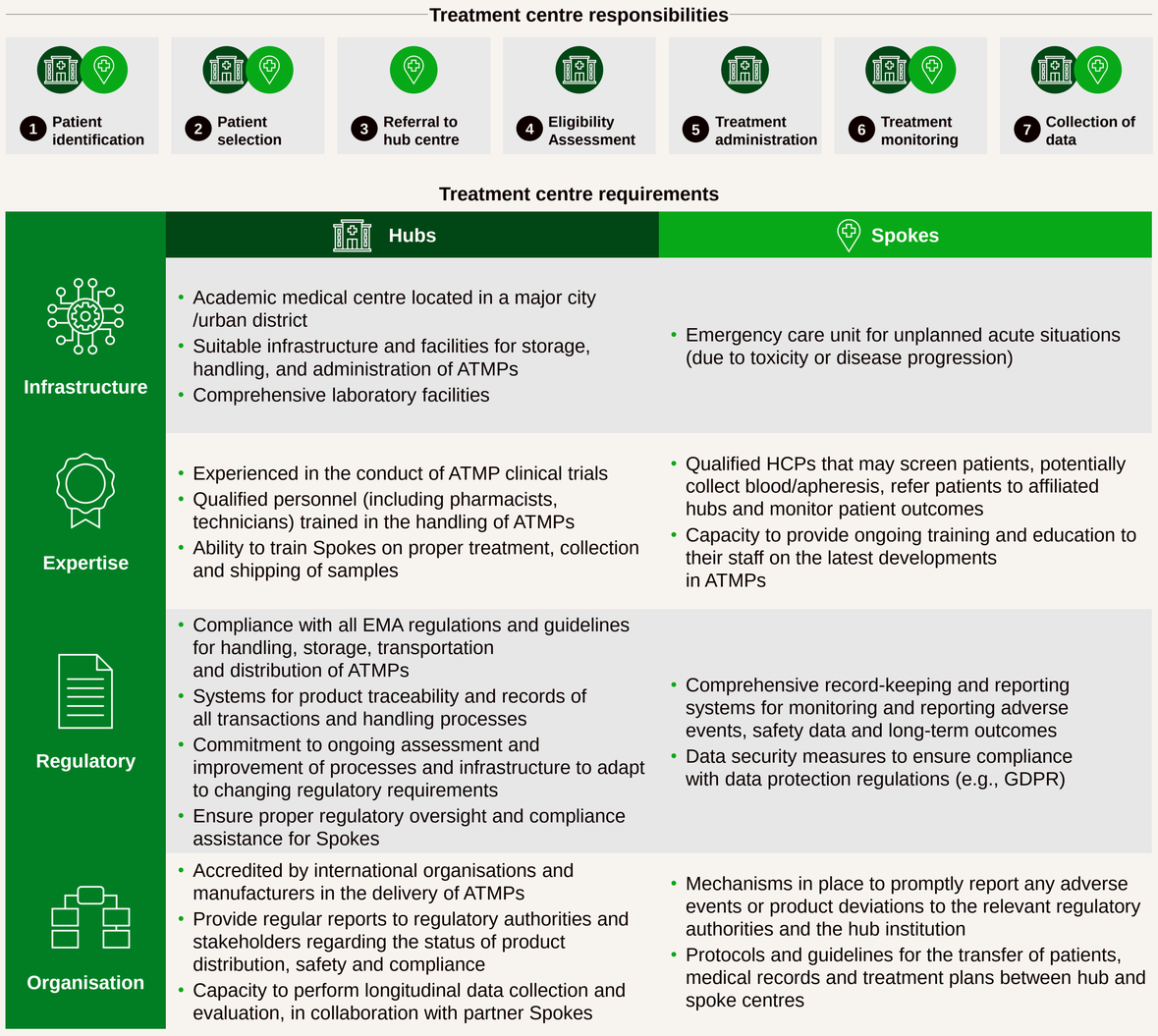

Figure 2. Responsibilities and requirements of hubs and spokes across the patient journey.

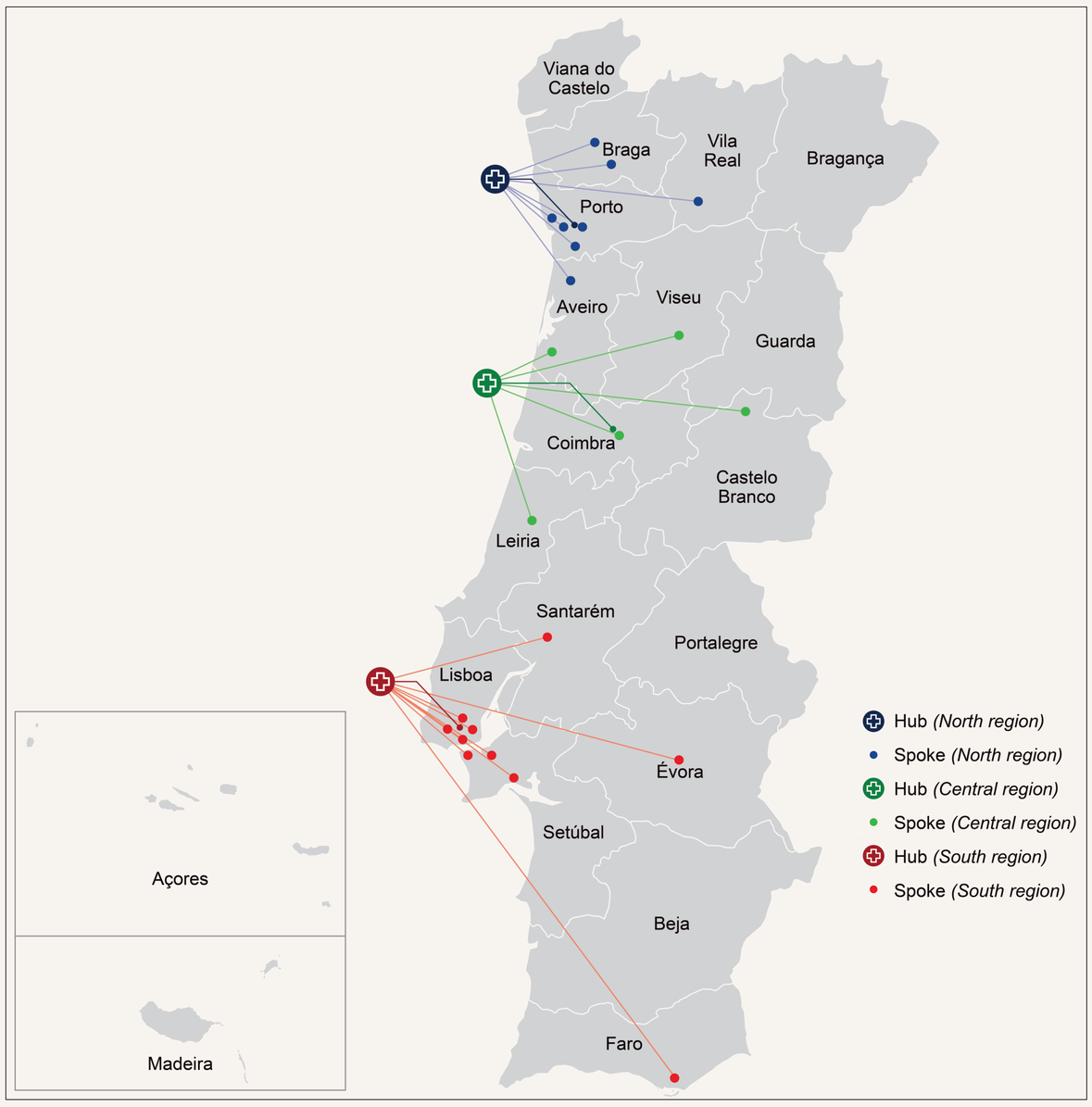

Figure 3. Hub-and-spoke simulation model for Portugal.

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