An exploration of bespoke, rigid, thermoplastic ankle-foot orthosis prescriptions and manufacturing techniques in the UK

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Introduction

Rigid ankle-foot orthoses (AFOs) are commonly prescribed to fully restrict ankle motion. The manufacturing process can have a significant impact on the effectiveness of an AFO which in turn influences the clinical outcome for the patient[1,2]. Research has highlighted key aspects of AFO design that are critical for effective prescription and manufacture[3,4]. The purpose of this work is to highlight the importance of precision in design parameters and reinforce the need for better standardisation and quality control in the production of rigid AFOs.

Method

- A mixed-methods study was conducted following ethic approval and divided into two phases:

Phase One – Quantitative:

- Structured questionnaires were distributed to three major UK orthotic manufacturers supplying bespoke rigid thermoplastic AFOs to the NHS. Each manufacturer recorded data for every NHS AFO prescription received over a two-month period (March–April 2024). The aim was to assess the detail and quality of prescription information from orthotists.

Phase Two – Qualitative:

- Semi-structured interviews were conducted with three experienced orthotic technicians. Thirty open-ended questions explored: (1) clinical integration of bespoke AFOs, (2) the effect of design on rigidity, (3) manufacturing practices, and (4) quality of information provided by clinicians.

Aim

This study explores the perspectives of orthotic technicians in the UK on the prescription and manufacturing of bespoke, rigid, thermoplastic AFOs and the information they receive from clinicians to guide manufacturing

Results

Data from 86 AFO prescriptions were collected. In 97% and 99% of cases, material type and thickness were specified, with copolymer polypropylene and 4.7 mm thickness most common.

Trim line designs were perceived as being clearly described in only 30 of 82 prescriptions. In 29 cases, the design was considered unclear, and in 23, it was omitted entirely. Of 17 prescriptions mentioning reinforcement, 12 lacked placement guidance, and only one was considered clear.

Interviews with technicians revealed three recurring challenges: (1) variability in prescription interpretation, (2) lack of consistent standard operating procedures, and (3) concerns about technician experience and training

Table 1: *Responses from the information provided in AFO prescription forms from prescribing clinicians to manufacturers*

		Num. of AFOs
Manufacturer (N=86, missing=0)	Birmingham Orthotic Solutions	49
	Buchanan Orthotics	8
	Peacocks Medical	31
Left/ Right (N=64= missing=22)	Left	31
	Right	33
Bilateral/ Unilateral (N=64= missing=22)	Bilateral	21
	Unilateral	43
Did the prescription specify the material to be used? (N=72, missing=14)	Yes	70
	No	2
Material type used (N=86, missing=0)	Copolymer polypropylene	65
	Homopolymer polypropylene	13
	Polyethylene	9
Did the prescription specify the material thickness to be used? (N=67, missing=19)	Yes	66
	No	1
Material thickness used (mm) (N=86, missing=0)	3	20
	4	15
	4.5	3
	4.7	39
	6	10
Did the prescription specify the design and extent of the trimlines? (N=82, missing=4)	No	23
	Yes - clearly	30
	Yes - not clearly	29
Was the AFO reinforced? (N=75, missing=11)	No reinforcement	58
	Yes - Reinforced using ribbing	9
	Yes - Reinforced using carbon fibre	8
	Yes - Reinforced using double thickness sole plate	0
Were there specific instructions about reinforcement placement provided? (N=17, missing=0)*	No	12
	Yes - clear	1
	Yes - not clear	4
Where was the reinforcement placed? (N=17, missing=5)*	Posterior to the malleoli	8
	At the malleoli	4
	Anterior to the malleoli	0

Discussion

The study exposes significant inconsistencies in the prescription and manufacture of bespoke rigid thermoplastic AFOs in the UK. Trim line designs were frequently absent or vague, and reinforcement instructions were rarely clear. Given the established relationship between trim line placement and stiffness, this poses risks to AFO performance. The findings emphasise the need for improved communication, prescription standardisation, quality control, and technician training to enhance orthosis quality and patient outcomes.

References

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