A Survey of the Lower Limb Amputee Population in Scotland 2020 and 2021 Public Report

SPARG
Scottish Physiotherapy Amputee Research Group

September 2023

Authors

Miss R Carr, SPARG Data Officer

Mrs J Hebenton, SPARG Chairman

Dr F Davie-Smith, SPARG Research Officer

Miss L Orr, SPARG Member

National Centre for Prosthetics and Orthotics
University of Strathclyde
Curran Building
131 St. James' Road
Glasgow G4 0LS

WestMARC
Queen Elizabeth University Hospital
1345 Govan Road
Glasgow G51 4TF

Contents

Tables and Figures

1 Acknowledgements

We wish to thank all physiotherapy teams who are involved in the work of SPARG and without whose loyal, tireless, and determined support this work would not have been accomplished.

SPARG would also like to thank the British Association of Chartered Physiotherapists in limb Absence Rehabilitation (BACPAR) for providing the funding to allow us to produce this report.

This 2020 & 2021 SPARG report is the first which compiles two years of data and reminds the reader of data from 2017 onwards. SPARG anticipate this to allow a more comprehensive comparison of the impact of COVID-19 and the impact this had on service delivery.

2 SPARG 2020 & 2021 Annual Report: Executive Summary

- The population of those with a major lower limb amputation in Scotland continue to have a median age of 66 years and 70% are male. The ratio of transtibial (TTA) to transfemoral (TFA) amputations is 1.4:1, this is largely unchanged since 2017

- The prevalence of diabetes in this cohort continues to increase with 55% recorded in 2021

- Dysvascular aetiology remains the leading cause of amputation in Scotland

- The number of patients limb-fitted overall remains constant at 40% –45%. The main difference in limb-fitting is between TTA and TFA level of amputation.

- In 2020 63% of those with TTA and 17% of those with TFA were limb-fitted. This is the lowest percentage limb-fitted after a TFA since 2017

- In 2021 there was an increase in limb-fitting overall; 69% of those with a TTA and 27% of those with a TFA were limb-fitted

- 2021 recorded the highest 30-day mortality (6.1%) in the last 5 years

- Recorded falls in hospital and at home reduced in 2020/2021, however those who became bilateral in the same episode had the highest % of falls recorded in hospital (25%)

- The median days to in-patient discharge, when fitted with a prosthesis were at the lowest in 2020 and 2021

- A positive change score in Locomotor Capabilities Index-5, indicates an improvement in mobility following amputation and a negative change score demonstrates a deterioration. The greatest level of community mobility achieved after amputation was in those with a unilateral TTA followed by bilateral TTA and lastly unilateral TFA

- In 2020 and 2021 the cohort with bilateral TTA did not improve as much as in previous years and now have a similar mobility as those with a unilateral TFA

At the time of writing this report, SPARG members expected there to be significant deterioration in the outcomes of those with an amputation in 2020/2021 due to the constraints of COVID-19 in Scotland. However this does not appear to have translated to the SPARG data reported. The more detailed Models of Care (MOC) may highlight why this was not the case (Section 10). Many hospitals and limb fitting centres adapted their service delivery to accommodate this patient cohort and as such we have not seen the increased mortality, delayed milestones and reduced limb fitting rates we had anticipated.

The full report can be accessed from the BACPAR website (BACPAR website: https://www.bacpar.org/resources/sparg-resources/sparg-public-reports/)

3 Introduction

This is the 29th Annual Report on data collated from all major lower limb amputations in Scotland by the Scottish Physiotherapy Amputee Research Group (SPARG). This is the first time we have produced a report combining two years of data. All major amputations carried out in 2020 and 2021 are included: ankle disarticulation (AD); transtibial (TTA); knee disarticulation (KDA); transfemoral (TFA); hip disarticulation (HD) and transpelvic (TP). Patients having partial amputations of the feet and amputation of the toes are excluded. All data are entered locally onto the SPARG web-based database. The database has reporting facilities which allow for local data checking and analysis.

National and individual hospital data are presented in this report. All outcomes are reported according to final level of amputation. Individual hospital data are summarised to facilitate comparison of outcomes and the benchmarking of services. The comparative data items or key performance indicators (KPIs) for each hospital were identified by a previous, multidisciplinary benchmarking exercise[3]. Each of the larger centres' (n≥10) MOC have been described according to criteria identified in the benchmarking report and agreed following consultation with SPARG members. Each MOC has been scored according to a system described in a recent study into the impact pathways have on rehabilitation milestones and outcomes after amputation [1].

Unfortunately, due to data governance restrictions for a seventh year, there are no data for those patients who underwent an amputation in the Grampian region, though the final number of amputees does include them. There were no other missing forms in 2020 & 2021.

The quality management "data checking" system introduced in 2003 continues to be successful with 99.4% completion.

4 Results: Demographic Profiles

4.1 Introduction

National survey data are presented in this section. Where possible, comparisons are shown for 2017-2021. The total number of amputees for 2020 and 2021 were 752 and 776 respectively; included in the analysis are 677 data sets from 2020 and 673 from 2021. Missing data includes all data sets from Grampian Health Board for both years (n= 75 in 2020 and n=103 in 2021) and those forms not returned for data input (n=0). In 2020, 677 patients underwent 709 amputation procedures and in 2021, 673 patients underwent 698 amputation procedures; some patients having had bilateral amputations during the same episode of care.

4.2 Amputee Details

4.2.1 Age and Sex Distribution

The report contains data from 677 amputees in 2020 and 673 in 2021.The data for numbers of amputees from 2017-2021 by age and gender is shown in Table 1. The median age was 67 years at time of amputation in 2020, reducing to 66 years in 2021 and the population were 70.8% male and 29.2% female in 2020, similar to 69.8% male and 30.2% female in 2021.

Table 1 Age and sex of amputee population, 2017- 2021

	2017	2018	2019	2020	2021
No. of Amputees	798	794	766	752	776
No. of Amputee with Data	714	706	691	677	673
Males %	70	70	71.5	70.8	69.8
Females %	30	30	28.5	29.2	30.2
Age Median	66	66	67	67	66
Age Upper Quartile	76	76	76	76	74
Age Lower Quartile	56	57	58	59	58

4.2.2 Immediate cause of amputation

Ischaemia was the main cause of amputation (Table 2) in those with PAD and those with Diabetes; with infection as the next leading cause. This is consistent with the past five years of data (Table 3).

Table 2 Cause of amputation recorded by level and by aetiology: 2020 and 2021

Cause of amputation 2020		Ischaemia	Infection	Combination *	N/A**
		412 (58%)	163 (23%)	102 (14%)	32 (5%)
Level n= 709 (0 missing)	TT	209	114	66	14
	TF	202	45	35	11
	TP	0	0	0	3
	HD	1	0	0	1
	KD	1	3	1	3
	AD	0	0	0	0
Aetiology n= 709 (0 missing)	PAD without diabetes	200 (84%)	12 (5%)	25 (11%)	0 (0%)
	Diabetes	187 (48%)	130 (33%)	72 (19%)	0 (0%)

Cause of amputation 2021		Ischaemia	Infection	Combination *	N/A**
		376 (54%)	195 (28%)	94 (13.5%)	31 (4.5%)
Level n= 698 (0 missing)	TT	141	103	43	12
	TF	157	54	27	10
	TP	0	0	0	0
	HD	0	1	1	2
	KD	1	1	0	0
	AD	0	0	0	0
Aetiology n= 698 (0 missing)	PAD without diabetes	176 (84%)	17 (8%)	15 (7%)	1 (0.5%)
	Diabetes	172 (45%)	139 (36%)	72 (19%)	2 (0.5%)

*****Combination is when both ischaemia and infection were present, ** N/A is not caused by either ischaemia or infection

Table 3 Cause of amputation 2017 – 2021

Cause of amputation	Ischaemia	Infection	Combination*	N/A**
2017	55%	21%	20%	4%
2018	50%	21%	22%	7%
2019	55%	23%	16%	5%
2020	58%	23%	14%	5%
2021	54%	28%	13.5%	4.5%

*Combination is when both ischaemia and infection were present, ** N/A is not caused by either ischaemia or infection

4.2.3 PAD and Diabetes

The following table summarises the age and sex of amputees with aetiology of diabetes and PAD without diabetes, 2017 - 2021.

More than half of all patients had the aetiology of diabetes recorded (55%) and these patients were younger than those with PAD without diabetes (median 4 years).

Table 4 PAD and Diabetes, age and sex, 2017 – 2021

	2017		2018		2019		2020		2021	
	Diabetes	PAD without diabetes	Diabetes	PAD without diabetes	Diabetes	PAD without diabetes	Diabetes	PAD without diabetes	Diabetes	PAD without diabetes
Number of Amputees	364	245	349	258	385	227	389	237	386	210
Number with age available	364	245	338	249	371	211	373	227	376	209
Age Median	65	72	66	72	67	71	68	71	66	70
Age Upper Quartile	74	78	74	79	75	77	75	78	74	77
Age Lower Quartile	54	62	59	63	58	62	60	63	58	62
N Male	264	163	256	171	283	141	287	150	269	140
N Female	100	82	82	78	88	70	86	77	107	61
Males %	72.5	66.5	75.7	68.7	76.3	66.8	76.9	66.1	71.5	69.7
Females %	27.5	33.5	24.3	31.3	23.7	33.2	23.1	33.9	28.5	30.3

4.2.4 Aetiology of Amputation

The incidence of each aetiology recorded is shown in Table 5. Peripheral arterial disease (without diabetes) and diabetes accounted for 88.3% of all amputations in 2020 and 85.4% in 2021.

Table 5 Aetiology of amputation, 2017 – 2021

	2017		2018		2019		2020		2021	
	N	%	N	%	N	%	N	%	N	%
PAD without diabetes	264	35.1	258	35.1	227	31	237	33.4	210	30.1
Diabetes	378	50.3	349	47.5	385	52.5	389	54.9	386	55.3
Trauma or Burns	21	2.8	21	2.9	23	3.1	13	1.8	18	2.6
Tumour	9	1.2	15	2	7	1	11	1.6	12	1.7
Congenital deformity	3	0.4	0	0	1	0.1	0	0	0	0
Drug abuse	12	1.6	19	2.6	9	1.2	7	1	13	1.9
Venous disease	16	2.1	6	0.8	8	1.1	10	1.4	17	2.4
Orthopaedic (total)* **	15	2.0	21	2.9	25	3.4	14	2	13	1.8
Orthopaedic – non union	12	1.6	13	1.8	15	2	9	1.3	10	1.4
Orthopaedic failed joint	1	0.1	3	0.4	2	0.3	0	0	2	0.3
Orthopaedic acquired deformity	2	0.3	3	0.4	3	0.4	1	0.1	1	0.1
Blood-borne infection	18	2.4	25	3.4	18	2.5	16	2.3	9	1.3
Renal Failure	1	0.1	7	1	5	0.7	2	0.3	1	0.1
CRPS *	9	1.2	8	1.1	12	1.6	5	0.7	10	1.4
Acute Vascular Injury	6	0.8	6	0.8	8	1.1	5	0.7	9	1.3
Not recorded	0	0	0	0	5	0.7	0	0	0	0
Total	752	100	735	100	733	100	709	100	698	100

* Chronic Regional Pain Syndrome (CRPS)

4.2.5 Initial Level of Amputation

Table 6 shows the incidence of six levels of amputation for the years 2017-2021. For those who had bilateral amputations in the reported period, both amputations are included in the data. The number of levels recorded will therefore be greater than the number of amputees for any given year. The level indicates the initial level of the amputation.

Table 6 Amputation Level, 2017-2021

	2017		2018		2019		2020		2021	
	N	%	N	%	N	%	N	%	N	%
Transtibial	423	56.3	417	56.7	440	60	403	56.8	407	58.3
Transfemoral	313	41.6	308	41.9	277	37.8	293	41.3	286	41
Trans pelvic	0	0	1	0.1	2	0.3	3	0.4	0	0
Hip Disarticulation	8	1.1	4	0.5	4	0.5	2	0.3	3	0.4
Knee Disarticulation	8	1.1	4	0.5	7	1	8	1.1	2	0.3
Ankle Disarticulation	0	0	1	0.1	3	0.4	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
Not recorded	0	0	0	0	0	0	0	0	0	0
Total	**752**	**100**	**735**	**100**	**733**	**100**	**709**	**100**	**698**	**100**

4.2.6 Patients Fitted with a Prosthesis

The number of patients fitted with a prosthesis at final discharge is shown in Table 7. Unilateral patients' limb-fitted are shown in Table 8, and bilateral patients are shown in Table 9. Table 10 gives more detail on bilateral patients fitted by their exact level of amputation. Table 11 shows the proportion of males and females who were fitted with a prosthesis, by level. Those patients who have abandoned limb-fitting are not included in this "limb-fitted" patient group.

The proportion of patients (all levels) fitted with a prosthesis was 39% in 2020, rising to 45.2% in 2021. When examined by level, 63.1% of TTA and 16.9% of TFA were fitted in 2020, in 2021 69.2% of TTA and 27.3% of TFA were fitted.

Table 7 Patients fitted with a prosthesis 2017– 2021

	2017	2018	2019	2020	2021
Total Number	714	704	691	677	673
Number fitted	313	318	284	264	304
Percentage fitted	43.8	45.2	41.3	39	45.2

Table 8 Proportion of patients with unilateral amputation fitted with a prosthesis by level 2017 – 2021

	2017	2018	2019	2020	2021
TTA (%)	66.4	64.6	65.4	63.1	69.2
TFA (%)	26.4	19.5	18.1	16.9	27.3
Other (%)	0	20	33.3	18.1	33.3

Abbreviations: TFA=transfemoral, TTA=transtibial

Table 9 Proportion of patients with bilateral amputation fitted with a prosthesis, bilateral 2017 – 2021

	2017	2018	2019	2020	2021
Bilateral – all levels %	38.7	29.3	21.9	29.2	22.7

Table 10 Bilateral patients fitted with a prosthesis by level 2020 and 2021

	Bilateral TTA		Bilateral TFA		TTA & TFA	
	2020 (n=51)	**2021** (n=46)	**2020** (n=36)	**2021** (n=49)	**2020** (n=21)	**2021** (n=23)
Limb-fitted % (n=)	54.9% (n=28)	52.2% (n=24)	2.8% (n=1)	0% (n=0)	19% (n=4)	13% (n=3)

Abbreviations: TFA=transfemoral, TTA=transtibial

Table 11 Sex and limb fitting outcome, by level, 2017– 2021

Unilateral TTA	**2017**	**2018**	**2019**	**2020**	**2021**
Total Males (n)	207	221	254	226	227
Total Females (n)	73	77	68	67	72
Males Limb-fitted (n)	151	155	178	152	161
Females Limb-fitted (n)	35	52	32	33	46
% Limb-fitted - Male	72.9	74.9	70.1	67.3	70.9
% Limb-fitted - Female	**47.9**	**25.1**	**47.1**	**49.3**	63.9
Unilateral TFA	**2017**	**2018**	**2019**	**2020**	**2021**
Total Males (n)	**187**	**187**	**127**	162	155
Total Females (n)	90	94	84	98	94
Males Limb-fitted (n)	56	64	24	34	45
Females Limb-fitted (n)	17	13	14	10	23
% Limb-fitted - Male	29.9	83.1	18.9	20.9	29
% Limb-fitted - Female	**18.9**	**16.9**	**16.7**	**10.2**	24.5
Bilateral	**2017**	**2018**	**2019**	**2020**	**2021**
Total Males (n)	95	75	104	87	85
Total Females (n)	47	39	42	26	34
Males Limb-fitted (n)	43	18	25	30	21
Females Limb-fitted (n)	9	15	7	3	6
% Limb-fitted - Male	45.3	24	24	34.5	24.7
% Limb-fitted - Female	19.1	38.5	16.7	11.5	17.6

Abbreviations: TTA=transtibial, TFA=transfemoral

4.2.7 Prosthetic Rehabilitation Abandoned

There are a number of patients each year who are initially fitted with a prosthesis and start prosthetic rehabilitation but for whom prosthetic treatment is abandoned prior to their final discharge. The amputation level referred to in this section is the final level if re-amputation surgery has been carried out. Table 12 shows those patients who have abandoned use of their prosthesis as a proportion of those initially fitted.

The number of those abandoning prosthetic use during the rehabilitation period fluctuates from year to year (2.5% in 2020, 2.2% in 2021). In 2020 3.1% (n=9) were unilateral TTA, 2.7% (n=7) were unilateral TFA and 0.9% (n=1) were bilateral (varying levels. Of 15 amputees who abandoned in 2021, 3% were unilateral TTA (n=9), 1.2% unilateral TFA (n=3) and 2.5% were bilateral of varying levels (n=3).

Table 12 Prosthetic rehabilitation abandoned as a proportion of those initially fitted, 2017–2021

	2017		2018		2019		2020		2021	
	N	%	N	%	N	%	N	%	N	%
All amputees	31	8.1	33	4.7	27	3.9	17	2.5	15	2.2
Unilateral TTA	15	6.6	19	6.4	14	4.3	9	3.1	9	3
Unilateral TFA	14	14.9	10	3.6	10	4.8	7	2.7	3	1.2
Other	1	33.3	0	0	0	0	0	0	0	0
Bilateral	1	1.7	4	3.5	3	2.1	1	0.9	3	2.5

Abbreviations: TFA=transfemoral, TTA=transtibial

4.2.8 Mortality

Table 13 shows the proportion of amputees who died within 30 days of their initial amputation, 2017 – 2021.

Table 13 Mortality 2017 - 2021

	2017	2018	2019	2020	2021
Number of amputees	714	706	691	677	673
30-day Mortality (N)	40	33	34	37	41
30-day Mortality (%)	5.6	4.7	4.9	5.5	6.1

4.2.9 Final Outcome Summary

Table 14 gives a summary of gross outcomes for all amputees at the time of final discharge from physiotherapy whether at in patient discharge or after a period of outpatient treatment from 2017 – 2021.non Limb-fitted now includes those who abandoned prosthetic use as that was their final outcome. Table 15 shows final outcome by aetiology and including those abandoned, for 2020 and 2021.

When grouped by aetiology, the greatest percentage of amputees **not** being fitted with a prosthesis are those with orthopaedic joint replacement (100%) and acute vascular incident (55.6%).

Table 14 Final outcome summary, 2017 - 2021

	2017		2018		2019		2020		2021	
	N	**%**	**N**	%	**N**	**%**	**N**	**%**	**N**	**%**
Limb-fitted	313	43.8	318	45.2	284	41.1	264	39	304	45.2
Not Limb-fitted	318	43.5	308	43.8	308	44.6	329	48.6	286	42.5
Deceased	83	11.6	78	11.1	96	13.9	84	12.4	83	12.3
Unknown	0	0	0	0	1	0.4	0	0	0	0

Table 15 Final outcome by aetiology for 2020 and 2021

Aetiology	Limb-fitted % (n)		Non-limb-fitted % (n)		Abandoned % (n)		Deceased % (n)	
	2020	2021	2020	2021	2020	2021	2020	2021
PAD	29.1 (66)	33.3 (67)	50.7 (115)	50.7 (102)	4 (9)	2 (4)	16.3 (37)	13.9 (28)
Diabetes	44 (164)	46.5 (175)	42.9 (160)	38 (143)	1.6 (6)	2.7 (10)	11.5 (43)	12.8 (48)
Trauma or burns	63.6 (7)	80 (12)	36.4 (4)	13.3 (2)	0	0	0	6.7 (1)
Tumour	54.5 (6)	83.3 (10)	36.4 (4)	8.3 (1)	0	8.3 (1)	9.1 (1)	0
Congenital deformity	0	0	0	0	00	0	0	0
Drug abuse	100 (2)	69.2 (9)	0	23.1 (3)	0	0	0	7.7 (1)
Venous disease	20 (2)	70.6 (12)	50 (5)	23.5 (4)	0	0	0	5.9 (1)
Ortho non-union	71.4 (5)	57.1 (4)	28.6 (2)	42.9 (3)	0	0	30 (3)	0
Ortho joint replacement	0	0	0	100 (2)	0	0	0	0
Ortho acquired deformity	0	100 (1)	0	0	100 (1)	0	0	0
Blood borne infection	31.3 (5)	55.6 (5)	62.5 (10)	11.1 (1)	6.3 (1)	0	0	33.3 (3)
Renal Failure	100 (2)	100 (1)	0	0	0	0	0	0
CRPS	60 (3)	40 (4)	40 (2)	50 (5)	0	0	0	10 (1)
Acute vascular incident	0	44.4 (4)	100 (4)	55.6 (5)	0	0	0	0

4.2.10 Unilateral and Bilateral Amputees

Table 16 shows the number of unilateral and bilateral amputees for the years 2017 -2021. In this table bilateral amputees includes all amputees who were bilateral in the reported year. Bilateral amputees are defined in more detail in Table 17 where there are two groups shown: those amputees who had a prior amputation; and those who were not previously amputees, that is, underwent bilateral amputations in the same episode of care.

Table 16 Unilateral and bilateral amputees, 2017 – 2021

	2017		2018		2019		2020		2021	
	N	%	N	%	N	%	N	%	N	%
Number of amputees	714	100	706	100	691	100	677	100	673	100
Unilateral amputees	572	80.1	590	83.5	545	78.8	564	83.3	554	82.3
Bilateral amputees	142	20.9	116	16.4	146	21.2	113	16.7	119	17.6

Table 17 Bilateral amputees, 2017- 2021

	2017		2018		2019		2020		2021	
	N	%	N	%	N	%	N	%	N	%
Bilateral Total	142	100	116	100	146	100	113	100	119	100
Bilateral – prior amputation(s)	104	73.2	86	74.1	104	71.2	81	71.7	94	79
Bilateral – both in same episode	38	26.8	29	25.9	42	28.8	32	28.3	25	21

4.2.11 Bilateral Amputations

Demographic and final outcome data for all with bilateral amputation are shown below in Table 18, 2020 and 2021

Table 18 Demographic profile and final outcome summary of those with bilateral amputations at end of rehabilitation period, 2020 & 2021

	Bilateral TTA		Bilateral TFA		TTA & TFA	
	2020	2021	2020	2021	2020	2021
Number	51	46	36	49	21	23
Age (median, years)	67.6	64	70	65	67.4	65
Gender (Male) %, (n)	84.3 (43)	71.7 (33)	75 (27)	75.5 (37)	71.4 (15)	60.9 (14)
Aetiology						
PAD without diabetes %	23.5 (12)	15.2 (7)	50 (18)	51 (25)	23.8 (5)	17.4 (4)
Diabetes % (n)	66.7 (34)	78.3 (36)	47.2 (17)	40.8 (20)	66.7 (14)	69 (16)
Other % (n)	9.8 (5)	6.5 (3)	2.8 (1)	8.1 (4)	9.5 (2)	12.9 (3)
Final Outcome						
Limb-fitted % (n)	54.9 (28)	52.2 (24)	2.8 (1)	0	19 (4)	13 (3)
Non-Limb-fitted %(n)	31.4 (16)	32.6 (15)	80.6 (29)	85.7 (42)	66.7 (14)	69.6 (16)
Died % (n)	13.7 (7)	15.2 (7)	16.7 (6)	14.3 (7)	14.3 (3)	4.3 (1)
Abandoned % (n)	0	0	0	0	0	13 (3)
Missing	0	0	0	0	0	0

Abbreviations: TFA=transfemoral, TTA=transtibial, PAD=Peripheral Arterial Disease.

4.2.12 Bilateral Amputations in Same Episode of Care

The number and levels of bilateral amputations carried out in the same episode of care are shown in Table 19 below for 2017-2021.

Table 19 Bilateral amputations, 2017-2021

	2017	2018	2019	2020	2021
Bilateral TTA	14	12	17	16	13
Bilateral TFA	18	13	22	10	9
TTA & TFA	5	4	2	4	3
Other	1	0	1	2	0
Total	38	29	42	32	25

Abbreviations: TFA=transfemoral, TTA=transtibial

4.2.13 Falls

Table 20 shows falls recorded for all amputees and also for unilateral and bilateral amputees (all levels) 2020 and 2021. Table 21 shows falls at home, for all amputees who had outpatient physiotherapy. Falls at home are not recorded for those who do not receive any physiotherapy following in patient discharge. Note this is not the number of falls but is the number of amputees who reported a fall during their rehabilitation period. Table 22 shows recorded falls in hospital for 2017 – 2021. Table 23 shows falls recorded both in hospital and at home by limb fitting outcome for 2020 and 2021.

Table 20 Reported falls in hospital for all amputees and also for unilateral and bilateral amputees (all levels) 2020 & 2021.

Amputee Inpatient rehab	**All Amputees**		**Unilateral**		**Bilateral -** previously unilateral		**Bilateral –** same episode	
	2020 n=677	**2021** n=673	**2020** n=564	**2021** n=554	**2020** n=81	**2021** n=94	**2020** n=32	**2021** n=25
In hospital % (n)	19% (128)	19% (129)	20% (114)	21% (117)	7% (6)	9% (8)	25% (8)	16% (4)

Table 21 Recorded falls at home for all amputees who had outpatient physiotherapy 2020 & 2021.

Amputees Outpatient rehab	**All Amputees**		**Unilateral**		**Bilateral -** previously unilateral		**Bilateral -** same episode	
	2020 n=281	**2021** n= 427	**2020** n=247	**2021** n=356	**2020** n=21	**2021** n=36	**2020** n=13	**2021** n=10
At home % (n)	17% (49)	15% (65)	18% (45)	17% (60)	9.5% (2)	11% (4)	15% (2)	10% (1)

Table 22 Recorded falls for all amputees 2017 – 2021.

Recorded falls	2017	2018	2019	2020	2021
In hospital	23.4%	22.2%	20.5%	19%	19%
At home	26%	16.8%	25.4%	17%	15%

Table 23 Recorded Falls based on Limb Fitting Outcome 2020 & 2021.

	Limb-Fitted		Non-Limb-fitted		Abandoned	
	2020	**2021**	**2020**	**2021**	**2020**	**2021**
Falls in hospital	26%	24%	14%	16%	29%	33%
Falls at home	15.5%	19%	n/a	n/a	47%	40%

4.2.14 Revisions and Re-amputations

The number of amputees having revision or re-amputation surgery is shown in Table 24. A revision is defined as further primary residual limb surgery which may involve bone but does not change the level of amputation. A re-amputation is defined as further surgery of the primary residual limb, which changes the level of amputation. Each revision and re-amputation are counted, therefore amputees who had a revision then a re-amputation would be included in both counts.

Re-amputations from the transtibial to the transfemoral level for 2017-2021 are shown in Table 25.

Table 24 Revisions and re-amputations, 2017-2021

	2017		2018		2019		2020		2021	
	N	%	N	%	N	%	N	%	N	%
Amputations	752	100	735	100	733	100	709	100	698	100
Revisions	12	1.6	10	1.4	14	1.9	20	2.8	11	1.6
Re-amputations	59	7.8	51	6.9	43	5.7	33	4.7	39	5.6
Total revisions + re-amputations	71	9.4	61	8.3	57	7.8	53	7.5	50	7.1

Table 25 Transtibial to transfemoral re-amputations, 2017-2021

	2017		2018		2019		2020		2021	
	N	%	N	%	N	%	N	%	N	%
Initial TTA	423	100	417	100	440	100	403	100	407	100
Re-amputated to TFA	54	12.8	43	10.3	41	9.3	31	7.7	38	9.3

Abbreviations: TFA=transfemoral, TTA=transtibial

4.2.15 Functional Co-morbidities Index

The Functional Co-morbidities Index (FCI) was incorporated into the data set from 2008 in an effort to account for the relatively high incidence of co-morbid disease in the lower limb amputee population (see Appendix F).

The FCI is completed by scoring 1 if a disease is present, that is, diagnosed and recorded in the medical notes of a patient, and 0 if not. A score of 0 indicates no co-morbid disease and a score of 18 the highest number of co-morbid illnesses.
Table 26 shows FCI by level and aetiology 2020 and 2021. The mean scores for 2017 – 2021 are shown in table 27.

Table 26 Functional Co-Morbidities by Level and Aetiology, 2020 & 2021

	Number		Min		Max		Mean	
	2020	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**
All	677	672	0	0	9	8	2.8	2.8
Level of Amputation								
Unilateral TTA	293	299	0	0	9	8	2.7	2.8
Unilateral TFA	260	248	0	0	9	8	2.8	2.8
Other	11	6	0	0	6	3	1.7	1.0
All Bilateral	113	119	0	0	7	8	3.0	3.0
Bilateral TTA	51	46	0	0	7	7	2.8	3.1
Bilateral TFA	36	49	0	0	6	6	3.1	2.8
TTA & TFA	21	23	0	1	6	8	3.4	3.0
Aetiology								
PAD without diabetes	227	200	0	0	9	8	2.5	2.65
Diabetes	373	376	0	0	9	8	3.2	3.22
Other	77	96	0	0	6	6	1.7	1.43

Abbreviations: TFA=transfemoral, TTA=transtibial, PAD=Peripheral Arterial Disease

Table 27 Functional Co-morbidities Mean Score, 2017 – 2021

	2017	**2018**	**2019**	**2020**	**2021**
All	3.1	3.1	2.9	2.8	2.8
Unilateral TTA	3.1	3.1	2.9	2.7	2.8
Unilateral TFA	3.1	3.0	2.9	2.8	2.8
Other	3.1	1.0	0.5	1.73	1.0
All Bilateral	3.3	3.1	3.0	3.0	3.0
PAD without diabetes	2.9	3.0	2.8	2.0	2.0
Diabetes	3.7	3.6	3.3	3.0	3.0

Abbreviations: TFA=transfemoral, TTA=transtibial, PAD=Peripheral Arterial Disease

5 Physiotherapy and Rehabilitation

5.1 *Compression Therapy*

Compression therapy of the residuum is widely used and figures for 2017-2021 are presented in Table 28. These figures capture the first method of compression used.

Table 28 Type of compression therapy used, 2017-2021

	2017		2018		2019		2020		2021	
	N	%	N	%	N	%	N	%	N	%
Elset 'S' bandage	2	0.4	0	0	0	0	2	0.6	1	0.3
Flowtron	6	1.1	2	0.3	1	0.3	2	0.6	4	1.1
Plaster cast	86	16.6	67	17.2	75	20.9	82	23.4	63	17.3
Shrinker sock	400	77.1	305	78.4	266	74.1	246	70.3	278	76.4
Silicone Sleeve	3	0.6	1	0.3	0	0	2	0.6	0	0
Other	0	0	1	0.5	0	0	1	0.3	2	0.5
PPAM*	22	4.2	13	3.3	17	4.7	15	4.3	16	4.4
Total	519	100	389	100	359	100	350	100	364	100

Abbreviations= PPAM Aid= Pneumatic Post Amputation Mobility Aid
*Inclusion of PPAM aid here indicates it has been used without the walking frame for compression therapy only

Table 29 Type of compression therapy used by amputation level (limb fitted), 2020 & 2021

	TTA (%)		TFA (%)		Bilateral TTA (%)	
	2020	2021	2020	2021	2020	2021
Plaster cast	25.9	21.8	n/a	n/a	28.6	9.5
Shrinker sock	64.3	74.1	70.5	87.9	67.9	81
PPAM aid bag	3.8	3.1	4.5	8.6	0	0
Unknown	5.4	0.5	13.6	0	0	4.8

5.2 Early Walking Aids

The types of Early Walking Aids (EWA) used in 2017-2021 are shown in Table 30. Table 31 shows EWA used by amputation level; these figures relate to the first device used.

Table 30 Type of EWA used, 2017-2021

	2017		2018		2019		2020		2021	
	N	%	N	%	N	%	N	%	N	%
Femurett	63	15.9	48	13.9	36	11.7	34	12.7	50	16.8
PPAM	333	83.8	297	86.1	273	88.3	232	86.6	247	83.2
Other	1	0.3	0	0	0	0	2	0.7	0	0
Total	397	100	345	100	309	100	268	100	297	100

Abbreviations: PPAM= Pneumatic Post Amputation Mobility Aid

Table 31 Type of EWA used by amputation level (Limb-fitted), 2020 & 2021

	TTA (%)		TFA (%)		Bilateral TTA (%)	
	2020	2021	2020	2021	2020	2021
PPAM aid	81.6	100	38.6	33.3	85.7	100
Femurett	n/a	n/a	50	66.7	0	0
Unknown	18.4	0	11.4	0	14.3	0

Abbreviations: PPAM= Pneumatic Post Amputation Mobility Aid, TFA=transfemoral, TTA=transtibial

5.3 Mobility Outcomes: Locomotor Capabilities Index-5 (LCI-5)

The LCI-5 is a widely used and validated self-report tool that measures a lower limb amputee's locomotor capabilities with their prosthesis during and after rehabilitation [4].

The LCI-5 is an amended version of the LCI in which the upper ordinal level is split into 2 according to the use or non-use of walking aids to give maximum sub-scores of 28 and total score of 56 [5]. The LCI-5 has been found to reduce the ceiling effect associated with the LCI by 50%[5,6]. The higher the score of the LCI-5 the greater the capabilities of the amputee. The LCI-5 is completed retrospectively for the amputee patient's mobility six months prior to their amputation and prospectively on final discharge. The difference between these two scores is calculated for each patient to give a score for their change in mobility. A positive score indicates an improvement in mobility and a negative score deterioration. All Basic and Advanced values in the tables below are the **mean** values.

Table 32 Locomotor Capabilities Index by level, 2017 - 2021

	6/12 Pre-amp			Final Outcome			
2017	**Basic**	**Adv.**	**Total**	**Basic**	**Adv.**	**Total**	**Change**
Transtibial (n=211)	22	18	40	18	14	31	-8
Transfemoral(n=88)	22	20	42	15	10	25	-17
Bilateral (n=55)	15	12	27	12	8	21	-6
	6/12 Pre-amp			**Final Outcome**			
2018	**Basic**	**Adv.**	**Total**	**Basic**	**Adv.**	**Total**	**Change**
Transtibial (n=188)	24	20	44	22	18	39	-5
Transfemoral(n=66)	25	23	48	21	15	36	-12
Bilateral transtibial (n= 23)	22	16	38	20	12	32	-6
2019	**6/12 Pre-amp**			**Final Outcome**			
	Basic	**Adv.**	**Total**	**Basic**	**Adv.**	**Total**	**Change**
Transtibial (n=210)	23	20	43	21	16	37	**-6**
Transfemoral (n= 38)	24	22	46	19	12	31	**-15**
Bilateral transtibial (n= 27)	19	15	34	16	11	27	**-7**
2020	**6/12 Pre-amp**			**Final Outcome**			
	Basic	**Adv.**	**Total**	**Basic**	**Adv.**	**Total**	**Change**
Transtibial (n=165)	24	20	44	20	16	36	**-8**
Transfemoral (n=40)	25	23	48	20	13	33	**-15**
Bilateral transtibial (n= 24)	23	20	43	18	11	29	**-14**
2021	**6/12 Pre-amp**			**Final Outcome**			
	Basic	**Adv.**	**Total**	**Basic**	**Adv.**	**Total**	**Change**
Transtibial (n=193)	25	22	47	21	17	38	**-9**
Transfemoral (n=68)	25	22	47	19	13	32	**-15**
Bilateral transtibial (n= 18)	24	19	43	20	12	31	**-12**

6 Milestone Data

6.1 Statistics Presented

This section of the report deals with the statistical analysis of the rehabilitation milestones. The four rehabilitation milestones are shown in the figure below: -

Milestones	Names by which milestones are referred to in this report
Number of days from final amputation to casting for prosthesis	*'Days to casting'*
Number of days from casting to delivery of prosthesis where delivery is defined as the date at which the patient begins gait training with the prosthesis – finished or unfinished.	*'Casting to delivery'*
Number of days from primary amputation to inpatient discharge (for patients having bilateral amputations and/or revision surgery see notes below)	*'Days to inpatient discharge'* (Length of stay)
Number of days from inpatient discharge to discharge from outpatient physiotherapy	'Days inpatient discharge to outpatient discharge'

Figure 1 Rehabilitation Milestones

For each milestone, the following descriptive statistics are presented: the number of amputees included in the analysis, median, upper and lower quartile.

Only those who were limb-fitted at outpatient discharge are included in *days to casting* and *casting to delivery*.

Where amputees have undergone revisions or re-amputations, the latest date of surgery is used as the date of amputation**.** The final level, in the case of re-amputations to higher levels, is used to group for this milestone.

Days to inpatient discharge is the length of stay in hospital for each amputee calculated in days from the date of amputation. The length of stay for those with bilateral amputations in same hospital admission is calculated from the date of first surgery.

The length of hospital stay for those re-amputated to a higher level will be calculated from the date of their final amputation.

For each milestone, and each group, the statistics represent available data including data from those who have died.

Groups with results prepared for all milestones	Additional groups for *days to inpatient discharge*
Transtibial Unilateral Fitted	Transtibial Unilateral Not Fitted
Transfemoral Unilateral Fitted	Transfemoral Unilateral Not Fitted
Bilateral* Fitted	Bilateral* Not Fitted

Figure 2 Groups in milestones

*Bilateral includes all those who underwent one amputation in the report period having had a prior amputation(s), and those who underwent bilateral amputations in the report period having had no prior amputations

6.2 Days to Casting

Table 33 **Days to casting milestone, descriptive statistics, 2020 & 2021.**

	All		Unilateral TTA		Unilateral TFA		Bilateral TTA		TTA & TFA	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Number Included	263	330	185	221	44	71	28	26	3	6
Lower Quartile	25	27	25	26	31	33	23	34	15	25
Upper Quartile	85	69	70	56	133	95	75	105	31	36.5
Median	40	38	38	35	64.5	52	32	61	31	31

Abbreviations: TFA=transfemoral, TTA=transtibial

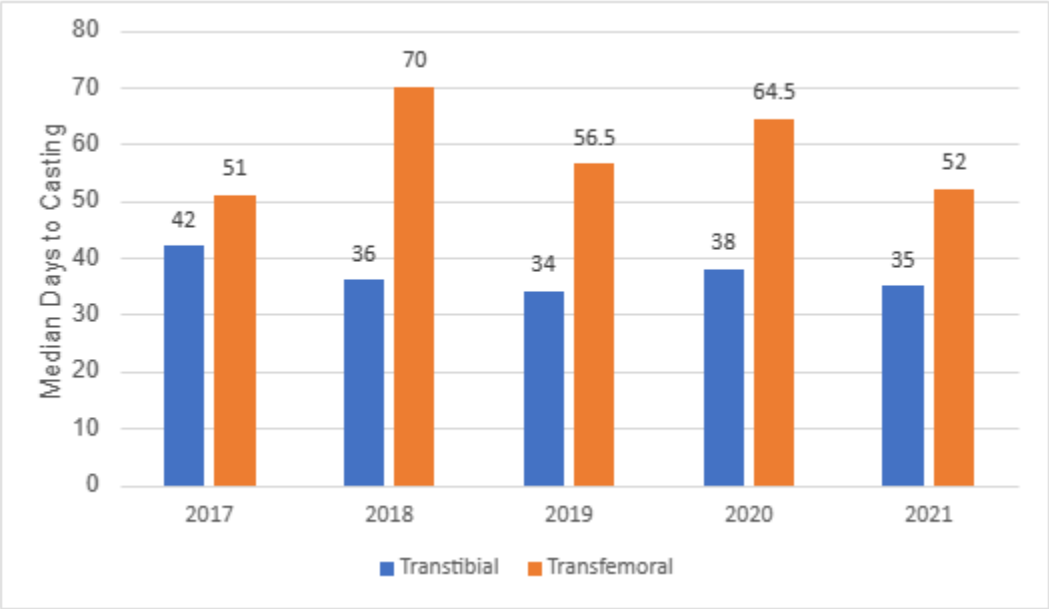


Figure 3 **Median days to casting milestone, for all unilateral TTA and unilateral TFA, 2017-2021**

6.3 *Casting to Delivery*

Table 34 Casting to delivery milestone, descriptive statistics, 2020 & 2021

	All		Unilateral TTA		Unilateral TFA		Bilateral TTA		Bilateral TFA		TTA & TFA	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Number Included	263	325	185	218	44	70	28	25	1	0	3	6
Lower Quartile	7	7	7	7	7	7	7	7	28	n/a	8	7
Upper Quartile	13	14	13	10	14	14	12	16	28	n/a	13	29.5
Median	7	7	7	7	7	9	7	8	28	n/a	13	14

Abbreviations: TFA=transfemoral, TTA=transtibial

Table 35 Median casting to delivery milestone, 2017-2021

	2017	2018	2019	2020	2021
TTA	10	9	8	7	7
TFA	13	14	14	7	9

Abbreviations: TFA=transfemoral, TTA=transtibial

6.4 Days to Inpatient Discharge: Fitted with a Prosthesis

Table 36 Days to inpatient discharge, fitted with a prosthesis, descriptive statistics, 2020 and 2021

	Unilateral TTA		Unilateral TFA		Bilateral TTA	
	2020	2021	2020	2021	2020	2021
Number Included	183	207	44	68	28	24
Lower Quartile	19	20	14	17.25	25	22.5
Upper Quartile	59	66	59	54.75	104	149
Median	32	38	26	28.5	51	96

Abbreviations: TFA=transfemoral, TTA=transtibial

Table 37 Median days to inpatient discharge, fitted with a prosthesis, 2017-2021 (Unilateral Only)

	2017	2018	2019	2020	2021
TTA	40	43	40	32	38
TFA	39	41	41	26	28.5

Abbreviations: TFA=transfemoral, TTA=transtibial

6.5 Days to Inpatient Discharge: Not Fitted with a Prosthesis.

Table 38 Days to inpatient discharge, patients not fitted with a prosthesis, descriptive statistics, 2020 & 2021.

	Unilateral TTA		Unilateral TFA		Bilateral TTA		Bilateral TFA		TTA & TFA	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Number Included	87	66	173	139	16	15	29	42	14	19
Lower Quartile	19	23.75	19	21	22.8	20	19.5	14.75	19	18
Upper Quartile	69	94	75.5	71	54.5	114	51.5	51.5	67.5	77
Median	39	51	36	36	33.5	58	32	24.5	48	41

Abbreviations: TFA=transfemoral, TTA=transtibial

Table 39 Median days to inpatient discharge, patients not fitted with a prosthesis, 2017-2021 (Unilateral Only)

	2017	2018	2019	2020	2021
TTA	44	43	40	39	51
TFA	40	38	42.5	36	36

Abbreviations: TFA=transfemoral, TTA=transtibial

6.6 Days from inpatient to outpatient discharge: Fitted with a prosthesis.

Table 40 shows the days from inpatient discharge to outpatient discharge (length of outpatient rehabilitation) for all limb-fitted patients 2020 and 2021; however, this does not consider the frequency or type of rehabilitation which will vary from hospital to hospital. The different models of care are described in Section 9.

Table 40 Days from inpatient discharge to outpatient discharge, limb-fitted amputees, 2020 & 2021

	Unilateral TTA		Unilateral TFA		Bilateral TTA	
	2020	2021	2020	2021	2020	2021
Number Included	183	205	44	68	27	24
Lower Quartile	49	38	53	115.25	48	3
Upper Quartile	161	150	224	244.25	126	110.5
Median	91	79	141	181	74	51

Abbreviations: TFA=transfemoral, TTA=transtibial

Table 41 Median Days from inpatient discharge to outpatient discharge, limb-fitted amputees 2017 - 2021

	2017	2018	2019	2020	2021
Transtibial	101	90	80.5	91	79
Transfemoral	145	141	153	141	181
Bilateral	75.5	107	111	74	51

7 Trends in Compression Therapy and Early Walking Aids (EWAs)

7.1 Statistics Presented

This chapter looks at trends in the use of compression therapy and Early Walking Aids (EWAs). All patients receiving compression therapy or EWA therapy are included in each analysis.

7.2 Trends in Compression Therapy

Of the patients receiving compression therapy, the percentage who received it within 10 days of amputation is shown in Table 42 for 2017-2021. A line chart representing this data is shown in Figure 4

Table 42 Patients receiving compression therapy within 10 days of amputation (%), 2017– 2021.

	2017	2018	2019	2020	2021
TTA	64.5	67	71.5	69.7	70
TFA	40.5	46.1	40.6	42.2	47.6

Abbreviations: TFA=transfemoral, TTA=transtibial

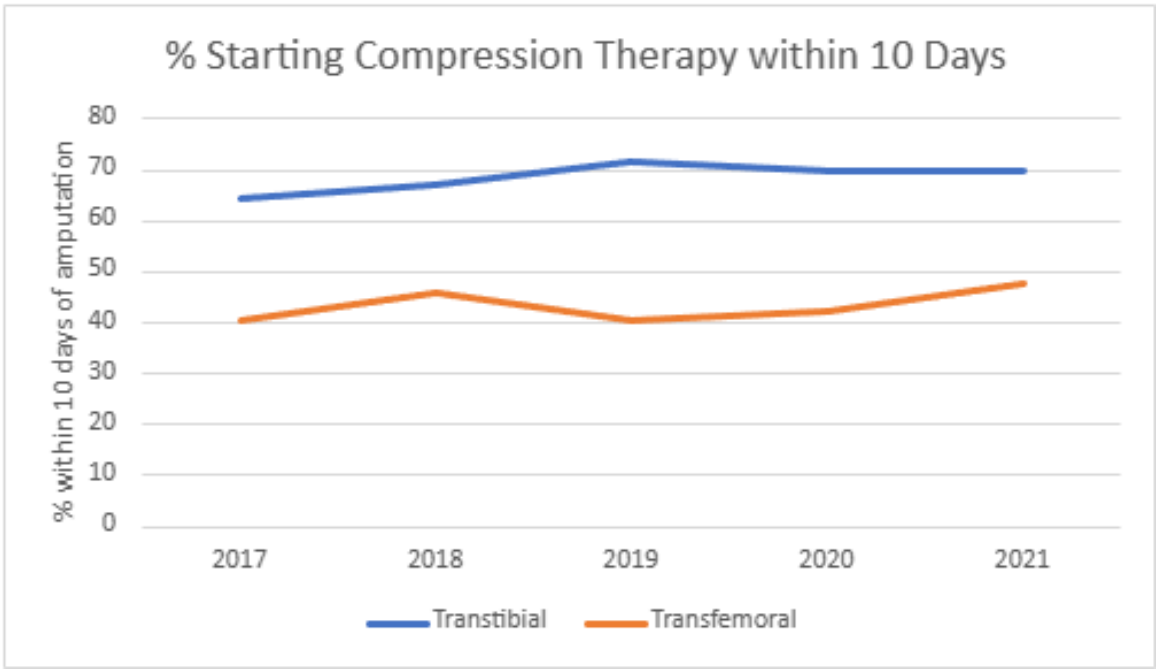


Figure 4 Percentage of unilateral transtibial and transfemoral amputees receiving compression therapy within 10 days of amputation surgery, 2017– 2021.

7.3 Trends in Early Walking Aids

Table 43 shows the percentage of those who received Early Walking Aid (EWA) therapy within 10 days of amputation surgery for 2017-2021, categorised by level of amputation. Note this only includes patients who received EWA therapy. A line chart representing this data is shown in Figure 5

Table 43 Patients using EWAs within 10 days of amputation (%), 2017– 2021.

	2017	2018	2019	2020	2021
TTA	27.4	31.1	28.6	43.2	39.3
TFA	28.0	20.4	16.1	20.3	19.7

Abbreviations: TFA=transfemoral, TTA=transtibial

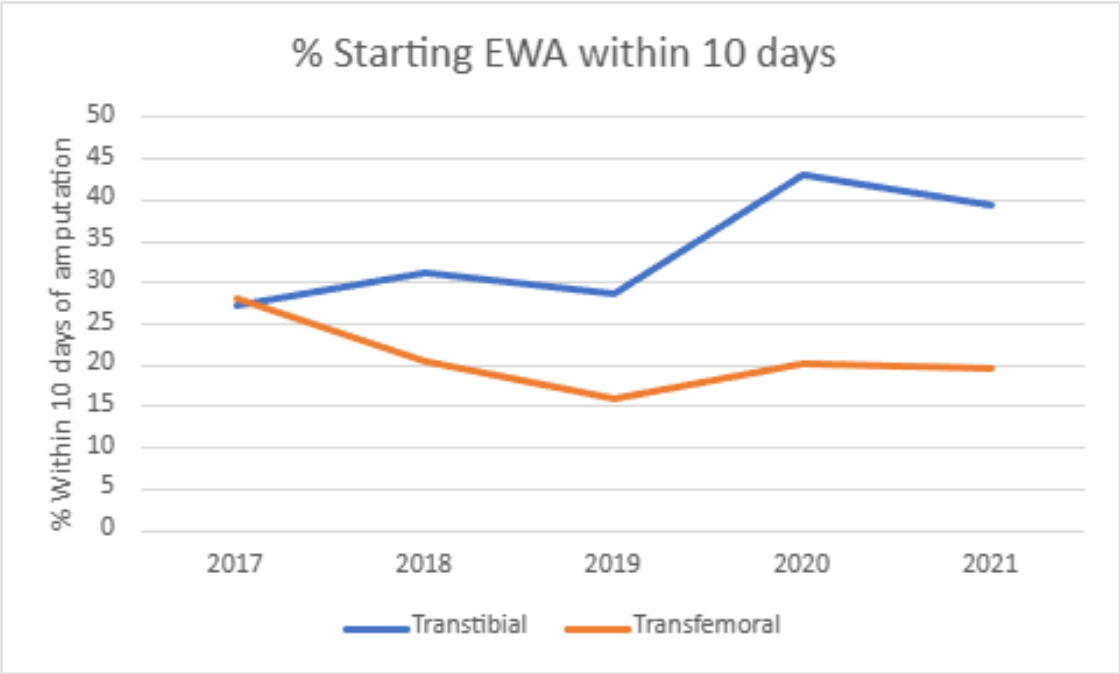


Figure 5 Percentage of unilateral transtibial and transfemoral amputees using EWAs within 10 days of amputation surgery, 2017- 2021.

8 Limb -fitting Centres

8.1 Hospital to Limb fitting centre

Each of the five limb fitting centres receives referrals depending upon their geographical location. Table 44 shows which limb-fitting centre each hospital refers to; the number of amputees in 2020 from each hospital, and the percentage Limb-fitted at each centre categorised into unilateral transtibial (TTA) and unilateral transfemoral (TFA) level.

Table 44 Limb-fitting centres, referring hospitals and % limb-fitted, 2020.

Limb-fitting Centres (LFC)	Referring hospital (n= number of TTA & TFA)	% Limb-fitted Unilateral TTA	% Limb-fitted Unilateral TFA
WestMARC (n=275) NHS GG&C NHS Forth Valley NHS D&G NHS Lanarkshire NHS A&A	Queen Elizabeth University Hospital (n=171)	62.5	20
	Glasgow Royal Infirmary (n=14)	75	50
	Royal Alexandria Hospital (n=0)	0	0
	Monklands University Hospital (n=0)	0	0
	Hairmyres Hospital (n=76)	57.6	16.3
	Forth Valley Royal Hospital (n=3)	0	50
	Dumfries and Galloway Royal Infirmary (n=9)	0	0
	Golden Jubilee National Hospital (n=1)	100	0
	University Hospital Wishaw (n=1)	0	0
Ayr (n=38) WestMARC satellite clinic	Ayr University Hospital (n=38)	66.7	5.9
SMART (n=113) NHS Lothian NHS Borders	Royal Infirmary of Edinburgh (n=113)	50	15
	St John's Hospital, Livingstone (n=0)	0	0
	Borders General (n=0)	0	0
TORT (n=95) NHS Tayside NHS Fife	Ninewells Hospital (n=95)	85.4	19.1
	Victoria Hospital, Kirkcaldy (n=0)	0	0
Raigmore (n=32) NHS Highland	Raigmore Hospital (n=32)	58.3	12.5
MARS (n=75*)** NHS Grampian	Aberdeen Royal Infirmary (n=71) Woodend Hospital (n=4)	**	**

Abbreviations: TFA=transfemoral, TTA=transtibial, **No data as Grampian not included in report

***please note the numbers for MARS include all levels of amputation

Table 45 shows which limb-fitting centre each hospital refers to; the number of amputees in 2021 from each hospital, and the percentage Limb-fitted at each centre categorised into unilateral transtibial (TTA) and unilateral transfemoral (TFA) level.

Table 45 Limb-fitting centres, referring hospitals and % limb-fitted, 2021.

Limb-fitting Centres (LFC)	Referring hospital (n= number of TTA & TFA)	% Limb-fitted TTA	% Limb-fitted TFA
WestMARC (n=293) NHS GG&C NHS Forth Valley NHS D&G NHS Lanarkshire NHS A&A	Queen Elizabeth University Hospital (n=176)	71.8	31.5
	Glasgow Royal Infirmary (n=12)	88.9	66.7
	Royal Alexandria Hospital (n=3)	50	0
	Monklands University Hospital (n=0)	0	0
	Hairmyres Hospital (n=80)	65.6	25
	Forth Valley Royal Hospital (n=0)	0	0
	Dumfries and Galloway Royal Infirmary (n=13)	57.1	50
	Golden Jubilee National Hospital (n=6)	100	50
	University Hospital Wishaw (n=3)	66.7	0
Ayr (n=40) WestMARC satellite clinic	Ayr University Hospital (n=40)	50	30.8
SMART (n=88) NHS Lothian NHS Borders	Royal Infirmary of Edinburgh (n=88)	56.5	26.2
	St John's Hospital, Livingstone (n=0)	0	0
	Borders General (n=0)	0	0
TORT (n=86) NHS Tayside NHS Fife	Ninewells Hospital (n=86)	80.4	11.4
	Victoria Hospital, Kirkcaldy (n=0)	0	0
Raigmore (n=38) NHS Highland	Raigmore Hospital (n=38)	65.4	33.3
MARS (n=103*)** NHS Grampian	Aberdeen Royal Infirmary (n=99) Woodend Hospital (n=4)	****	**

Abbreviations: TFA=transfemoral, TTA=transtibial, **No data as Grampian not included in report

***please note the numbers for MARS include all levels of amputation

8.2 Milestones by Limb-fitting centre

The number of, and milestones data for limb-fitted unilateral TTA are presented for each hospital in Table 46 for 2020 and 2021

Table 46 Key performance Indicators (milestones) for unilateral TTA, by limb-fitting centre, 2020 & 2021

Limb fitting Centre	Number		Days to Casting		Days to Delivery	
	2020	2021	2020	2021	2020	2021
WestMARC (NHS GG&C)	89	115	32	33	50	42
Ayr (satellite clinic of WestMARC)	14	7	54	45	69	57
SMART	27	26	70	52.5	76	63
TORT	41	41	24	29	32	50
Raigmore	14	17	54.5	33	157	34
MARS**	**	**	**	**	**	**
National Median	185	207	38	35	51	46

**No data as Grampian not included in report

Definitions:

Days to casting — Median days from final surgery to casting for prosthesis.

Days casting to delivery — Median days from final surgery to delivery of prosthesis

.

9 Models of Care

Each hospital's model of care (MOC) varies and the impact this has on the achievement of rehabilitation milestones and outcomes is complex and influenced by many factors including patient demographics (see Table 47). Hebenton et al 2019 identified key aspects of services that appear to improve speed and outcomes of rehabilitation after lower limb amputation[1]. These key aspects have been used to develop the weighted MOC scoring system used in this report.

Table 47 MOC Scoring system

MOC	Descriptor	Score
Immediate post-operative rigid dressing	0 = not used 1 = used with some patients 2 = used routinely	**2**
Specialist physiotherapy in first 14 days	0 = non-specialist physio 1 = non-specialist supported by specialist e.g. in-reach 2 = specialist physio	**2**
Daily inpatient gym session (Mon- Fri)	0 = no gym sessions 1 = gym sessions 2-3 per week or daily ward sessions 2 = daily gym sessions	**2**
Inpatient gym session ≥ 1 hour	0 = < 60 mins 1 = ≥ 60 minutes	**1**
Prosthetic Service on site when in patient	0 = on site 1 = not on site	**1**
Prosthetic provision as an in patient LF = limb fitted, IP =inpatient, OP = outpatient	0 = LF as OP 1 = some patients LF as IP and/or all patients cast as IP 2 = all patients LF as IP	**2**
Routine specialist outpatient physiotherapy service	0 = not routine 1 = routine	**1**
	Maximum score	**11**

Aspects found to be statistically significant in previous study[2] have been given a higher rating i.e. 2
Score < optimum means aspect is only partially available

Section 9.1 includes each of the major centres Model of Care descriptor and their MOC score (as per the table above), as well as details of the challenges imposed by COVID regulations at each centre in 2020 and 2021.
Each centres unilateral transtibial milestone data, for the last 5 years (2017 – 2021), Is also included in this section, with the exception of Grampian.

Centralisation of the vascular services in Greater Glasgow and Clyde began in 2010. In early 2019, further centralisation resulted in patients from Forth Valley travelling to the Queen Elizabeth University Hospital (QEUH), in Glasgow, for surgery. Repatriation to Forth Valley Royal Hospital, for rehabilitation, was planned for 7 -10 days post-surgery and this resulted in 2 different pathways following amputation surgery in QEUH. The differing milestones for each pathway are documented in section 9.1.10.

9.1 Individual Hospital data

9.1.1 Aberdeen Royal Infirmary (ARI), NHS Grampian

- Immediate post-operative rigid dressings are not routinely used
- Patients will receive treatment from a specialist physiotherapist, initially at ARI. (2) Those suitable for limb fitting will move to a 6 bedded rehab unit at Woodend Hospital.
- Patients who are assessed as suitable for prosthetic fitting will have physiotherapy in the form of gym-based sessions (both 1:1 and group sessions), routinely receiving one treatment session five days a week (2), with an average session lasting 45 minutes.
- Prosthetic Service, MARS is located on site at Woodend Hospital (1)
- Patients are routinely discharged after prosthetic fitting (2). However, if wound healing is delayed, patients may be discharged and re-admitted to Woodend Hospital once they are able to commence EWA and prosthetic rehabilitation. Physiotherapy at Woodend Hospital is provided by staff travelling from ARI with support from 0.4 HCSW based permanently at Woodend.
- Prosthetic candidates will have access to physiotherapy after discharge as required. The level of input is dependent on geography and ongoing rehabilitation goals. Local patients may access specialist physiotherapist up to two times a week. When geography necessitates non-specialist physiotherapy input, the physiotherapist will be supported by the prosthetic centre. Patients can be re-admitted to 6 bedded unit for 1-3 weeks intensive rehabilitation, five days a week.
- Patients who are not appropriate for prosthetic fitting will receive physiotherapy in the form of both gym based and ward sessions. These will be both 1:1 and in group settings. Patients will routinely receive 1 treatment session 3 days a week with an average session lasting 30 minutes. Following discharge from hospital physiotherapy will be provided as required by community non-specialist staff.
- On referral from medical staff, patients are offered an early pre amputation home visit with OT and physiotherapy staff.

MOC=7/11

COVID Challenges	2020	2021
Rehabilitation Beds	Rehabilitation beds no longer available at ARI or Woodend Hospital	Woodend rehabilitation beds recovered in July and 2 beds at ARI available - readmission for rehabilitation
Specialist staff	Staff redeployed, no cross site working until August	Treatment delivered by specialist staff
Rehabilitation area	Lost gym/ rehab space, until October	New gym space available
Prosthetic service	MARS, located at Woodend Hospital –virtual service until August. Primary patients prioritised	Service operating in line with social distancing guidelines
Outpatient service	Slowly commenced from August 2020, increased number of Home Visits, Near me appointments and supporting community input.	Service delivered from new therapy space with social distancing.

9.1.2 University Hospital Ayr, NHS Ayrshire & Arran

- Immediate post-operative rigid dressings are not routinely used.
- Following an amputation on the vascular ward, patients at Ayr Hospital will receive treatment from a specialist physiotherapist (2).
- In patient treatment will be delivered as both one-to-one and group-based sessions. These will take place both on the ward and in the therapy gym. Patients will routinely receive two treatment sessions daily (2), Monday to Friday, with average treatment time lasting 60 minutes (1).
- The Prosthetic service is delivered by a satellite clinic held at Ayr Hospital (1).
- Patients who are appropriate for prosthetic-review will routinely be discharged before their first casting.
- Once discharged from in-patient care, prosthetic candidates will have access to out-patient physiotherapy at one of two locations (Ayr Hospital or Ayrshire Central Hospital in Irvine). They will see a specialist physiotherapist (1) twice a week and have access to outreach community physiotherapy.
- Patients, who are not appropriate for prosthetics, will receive the same level of in-patient input, but do not routinely access physiotherapy on discharge unless required. When required, their physiotherapy input will occur via a domiciliary service.

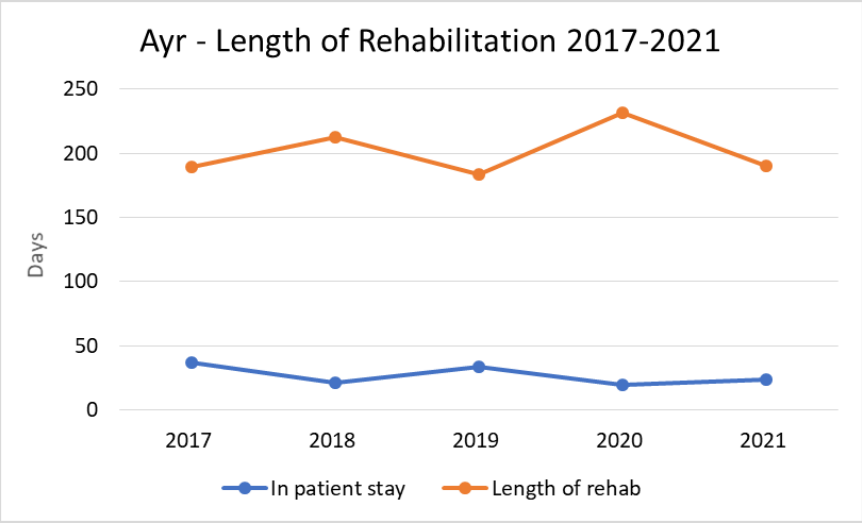
MOC=7/11

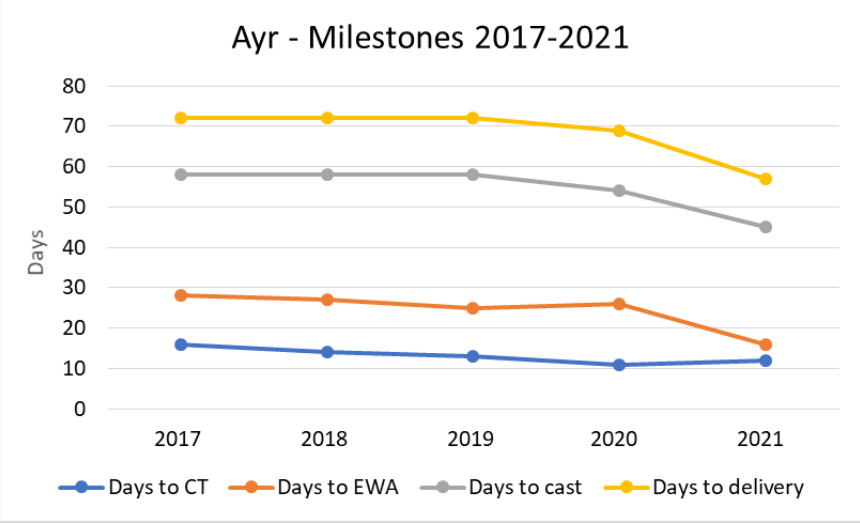
COVID Challenges	2020	2021
Rehabilitation Beds	In-patient vascular beds moved to a new ward	Beds available in vascular ward
Specialist staff	Specialist staff remain on the unit	Specialist staff remain on unit
Rehabilitation area	Use of gym for 1:1 sessions only, no group activity	Group gym sessions re-commenced with restrictions imposed by social distancing
Prosthetic service	Satellite clinic (WestMARC) – Primary patients prioritised	Satellite clinic running in gym with social distancing, which limited numbers
Outpatient service	1:1 treatments sessions, Near Me consultations and increased number of Home Visits	Increased number of patients in gym sessions but still limited by social distancing regulations

5-year milestone data following Unilateral Transtibial Amputation (2017 – 2021)

University Hospital Ayr – Unilateral Transtibial Milestones							
	Limb-fitted N (%)	Days to CT	Days to EWA	Days to cast	Days to delivery	In patient stay	Length of rehab
2017	19 (64%)	16	28	58	72	37	189
2018	17 (74%)	14	27	58	72	21	213
2019	16 (80%)	13	25	58	72	34	184
2020	14 (67%)	11	26	54	69	20	231.5
2021	7 (50%)	12	16	45	57	24	190

CT – Compression Therapy, EWA – Early Walking Aid.





9.1.3 Glasgow Royal Infirmary (GRI), NHS Greater Glasgow & Clyde

- Immediate post-operative rigid dressings are not routinely used
- Following an amputation, patients at GRI will receive treatment from a non-specialist physiotherapist. Rehabilitation will occur in their amputating bed
- In-patient, physiotherapy will take the form one-to-one sessions. These will take place on the ward (no gym/ group treatment as an inpatient). Patients will routinely receive one treatment session daily, Monday to Friday (1), with average treatment time lasting 30 minutes. There is provision for rehabilitation at the weekend as required.
- The Prosthetic service is delivered from WestMARC.
- Patients who are appropriate for prosthetic-review will routinely be discharged before their first casting.
- Prosthetic candidates will have access to out-patient physiotherapy follow-up at WestMARC, their nearest limb-fitting centre. They will see a specialist physiotherapist (1) twice a week and have access to community outreach, clinical psychology and specialist OT services.
- Patients who are not appropriate for prosthetics will receive the same level of in-patient input, but do not routinely have access to out-patient physiotherapy follow-up unless required.

MOC = 2/11

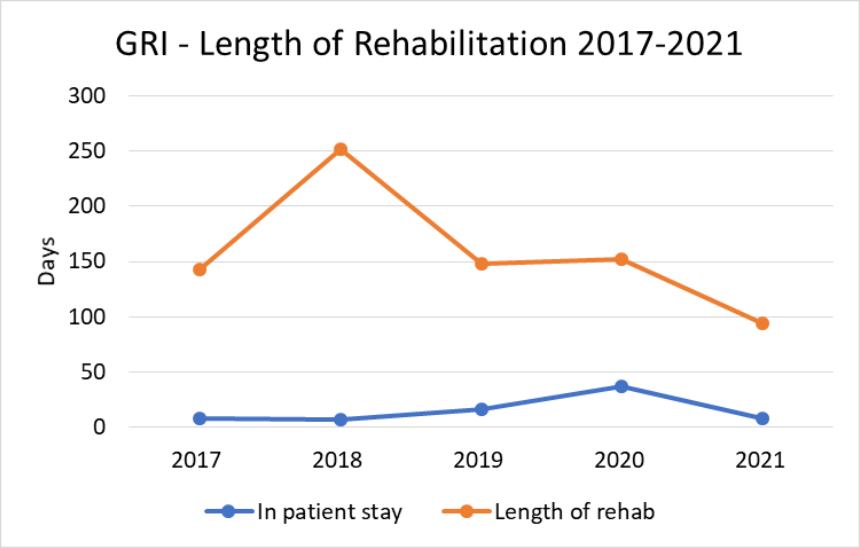
<u>It should be noted that there is no vascular surgery at GRI</u>.

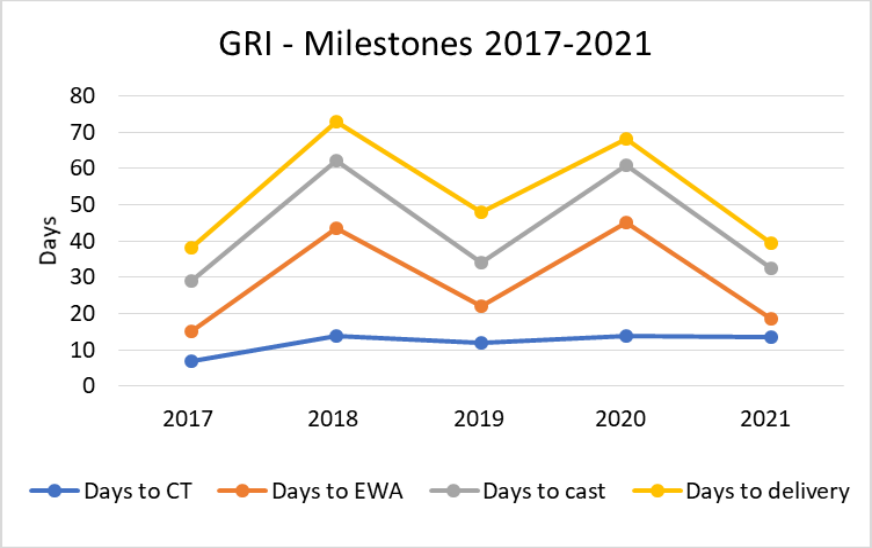
COVID Challenges	2020	2021
Rehabilitation Beds	Oncology beds moved to Golden Jubilee National Hospital No elective orthopaedic surgery, minimal trauma	Oncology beds at Golden Jubilee National Hospital Slow return of orthopaedic surgery to GRI
Specialist staff	Support from specialist staff at WestMARC	Ongoing support from specialist staff at WestMARC
Rehabilitation area	1:1 treatment sessions in patients' room, until able to attend WestMARC gym as an outpatient	1:1 treatment sessions in patients' room, until able to attend WestMARC gym as an outpatient
Prosthetic service	WestMARC - Primary patients prioritised	WestMARC operating within social distancing guidelines
Outpatient service	Delivered from WestMARC, 1:1 treatment sessions, Near Me consultations, Home Visits	Ongoing service delivery with restrictions due to social distancing.

5-year milestone data following Unilateral Transtibial Amputation (2017 – 2021)

Glasgow Royal Infirmary – Unilateral Transtibial Milestones							
	Limb-fitted N (%)	Days to CT	Days to EWA	Days to cast	Days to delivery	In patient stay	Length of rehab
2017	5 (100%)	7	15	29	38	8	142.5
2018	7 (70%)	14	43.5	62	73	7	252
2019	7 (88%)	12	22	34	48	16	148
2020	9 (75%)	14	45	61	68	37	152
2021	8 (89%)	13.5	18.5	32.5	39.5	7.5	94
2021	7 (50%)	12	16	45	57	24	190

CT – Compression Therapy, EWA – Early Walking





9.1.4 Royal Infirmary Edinburgh (RIE) / Astley Ainslie Hospital, NHS Lothian

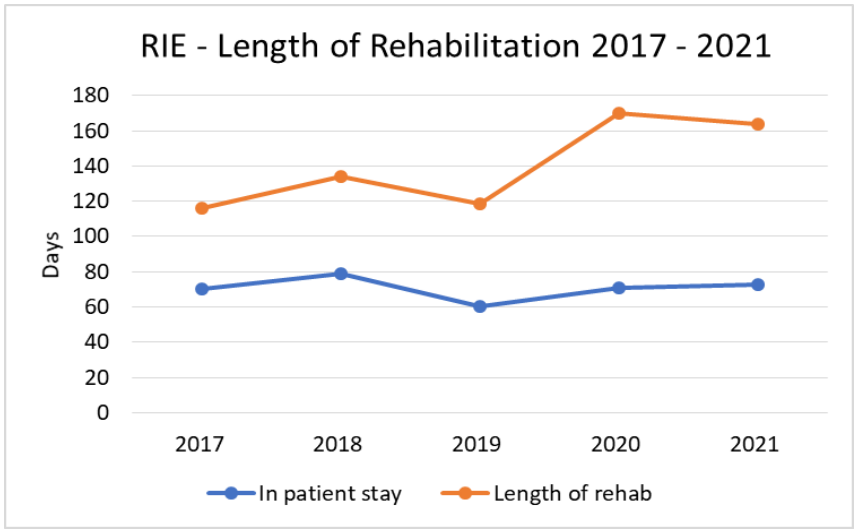
- Immediate post-operative rigid dressings are not routinely used
- Following amputation, patients at RIE will receive treatment from a non-specialist physiotherapist. They will be reviewed by the in-reach team from Astley Ainslie Hospital and those who are appropriate for prosthetic-review will be transferred to a rehabilitation bed at AAH from 7 – 21 days post op, where they will receive treatment from a specialist physiotherapist (1)
- As an inpatient at RIE, physiotherapy sessions are delivered x 2 per week by the in-reach physiotherapists and occasional ward sessions may be provided by the surgical team. Following transfer to AAH, physiotherapy will take the form of one-to-one and group sessions based mainly in a physiotherapy gym. Patients will receive up to three sessions daily, Monday to Friday (2), with an average total daily treatment time lasting 60 minutes (1).
- Patients can be sent home to heal and may be readmitted for rehabilitation and prosthetic fitting or may attend as an outpatient.
- The Prosthetic service is delivered from SMART, which is on-site at Astley Ainsley (1).
- Patients will routinely be discharged home after prosthetic fitting (2).
- Outpatient physiotherapy is provided routinely as required (1). All prosthetic patients will be reviewed in an MDT clinic 6 weeks after discharge.
- Physiotherapy input for in-patients not proceeding with prosthetic fitting will be gauged in accordance with specific rehab goals. On discharge, these patients do not routinely have access to out-patient physiotherapy. MOC=8/11

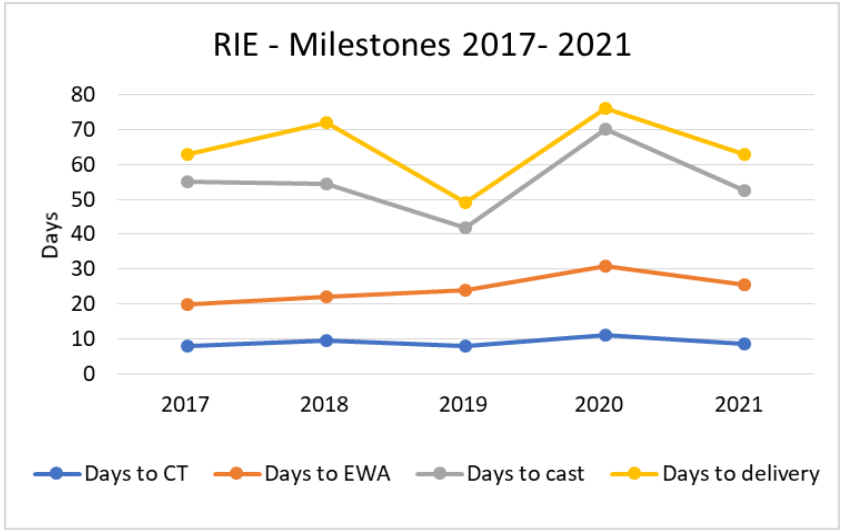
COVID Challenges	2020	2021
Rehabilitation Beds	No reduction in beds - retained 13 inpatient beds at Astley Ainsley	No reduction in beds -retained 13 inpatient beds at Astley Ainsley
Specialist staff	No change in staffing at Astley Ainsley but unable to support Outreach service at ERI from April until August	Specialist staffing as pre COVID
Rehabilitation area	Gym sessions for inpatients, as they were “in a bubble “	Gym sessions for inpatients and outpatients in group setting, in line with COVID guidelines
Prosthetic service	SMART (on-site) -Primary patients prioritised	SMART - operating at reduced capacity due to social distancing
Outpatient service	No outpatient service	Outpatient service resumed, delivered with limitations of social distancing

5-year milestone data following Unilateral Transtibial Amputation (2017 – 2021)

Royal Infirmary of Edinburgh/ Astley Ainsley Hospital – Unilateral Transtibial Milestones							
	Limb-fitted N (%)	Days to CT	Days to EWA	Days to cast	Days to delivery	In patient stay	Length of rehab
2017	18 (41%)	8	20	55	63	70	116
2018	38 (72%)	9.5	22	54.5	72	79	134
2019	33 (61%)	8	24	42	49	60.5	118.5
2020	27 (50%)	11	31	70	76	71	170
2021	26 (57%)	8.5	25.5	52.5	63	72.5	164

CT – Compression Therapy, EWA – Early Walking Aid





9.1.5 Dumfries & Galloway Royal Infirmary, NHS Dumfries & Galloway

- Immediate post-operative rigid dressings are not routinely used
- Following repatriation from University Hospital Hairmyres, patients at DGRI Hospital will receive treatment from a specialist physiotherapist (2). Rehabilitation will initially occur as an inpatient, then depending on rehab needs and discharge planning, patients may be transferred to a rehabilitation unit either in DGRI or a community hospital. Whilst there is provision for rehabilitation beds for amputees, their physiotherapy input remains specialist.
- In-patient, physiotherapy will take the form of both one-to-one and group-based sessions. Patients will routinely be seen daily, Monday to Friday (2), with an average treatment session lasting 60 minutes (1).
- The Prosthetic service is delivered from WestMARC.
- There is no specific protocol/pathway for time of discharge in patients' hospital stay i.e., pre-cast, post-cast, after limb-fitting (1)
- Prosthetic candidates will have access to out-patient physiotherapy follow-up at their nearest acute hospital, DGRI or Galloway Community Hospital. They will see a physiotherapist more than once a week, this may be a specialist, dependent on location.
- Patients, who are not appropriate for prosthetics, will receive the same level of in-patient input, but do not routinely have access to out-patient physiotherapy follow-up.

MOC = 6/11

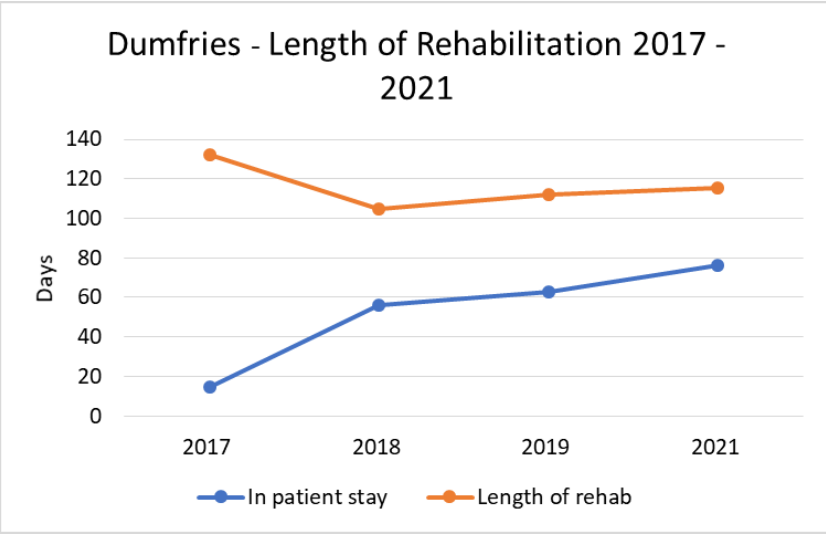
From September 2019 patients were transferred to University Hospital Hairmyres for vascular surgery, then repatriated for rehabilitation

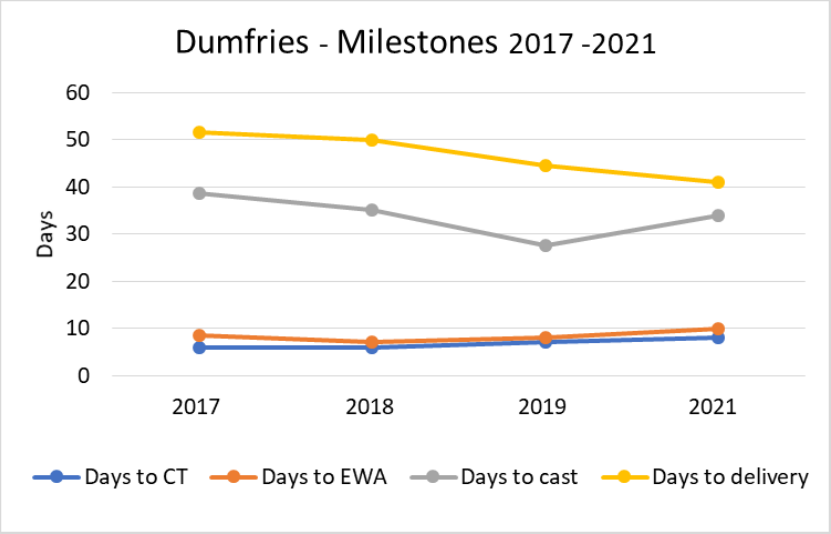
COVID Challenges	2020	2021
Rehabilitation Beds	No changes	No changes
Specialist staff	Specialist staff working with patients	Specialist staff working with patients
Rehabilitation area	In-patient rehabilitation on ward	In-patient gym sessions maintaining social distancing
Prosthetic service	WestMARC - Primary patients prioritised	WestMARC prosthetic services open but operating at reduced capacity due to social distancing
Outpatient service	From April to August service delivered by WestMARC, 1:1 treatment sessions and Near Me consultations.	Longer in-patient stays to provide rehabilitation. Limited out-patient service

5-year milestone data following Unilateral Transtibial Amputation (2017 – 2021)

Dumfries and Galloway - Unilateral Transtibial Milestones							
	Limb-fitted N (%)	Days to CT	Days to EWA	Days to cast	Days to delivery	In patient stay	Length of rehab
2017	4 (50%)	6	8.5	38.5	51.5	14.5	132
2018	9 (75%)	6	7	35	50	56	105
2019	7 (64%)	7	8	27.5	44.5	63	112
2020 *	0 (0%)	0	0	0	0	0	0
2021	4 (57%)	8	10	34	41	76	115.5

CT – Compression Therapy, EWA – Early Walking Aid.





<u>*There were no unilateral transtibial amputations carried out in Dumfries and Galloway in 2020</u>

9.1.6 Raigmore Hospital, NHS Highland

- Immediate post-operative rigid dressings are used with some patients (1).
- Following an amputation, patients at Raigmore Hospital will receive treatment from a specialist physiotherapist (2).
- As an in-patient, physiotherapy will take the form of both one-to-one and group sessions based on the ward and in a therapy gym. Patients will routinely receive one treatment session daily (1), Monday to Friday, with an average treatment session lasting 60 minutes (1). Once a patient is limb fitted, they will then receive a second session of 40 minutes.
- The Prosthetic service is delivered on site at Raigmore (1).
- Patients will routinely be discharged home after prosthetic fitting (2).
- Prosthetic candidates will have access to out-patient physiotherapy. Where geography allows, they will receive a weekly session at the acute hospital with a specialist physiotherapist. Where distance is an issue, they can attend non-specialist physiotherapy at their nearest community hospital.
- Patients, who are not appropriate for prosthetics, will receive the same level of in-patient input, but do not routinely access physiotherapy on discharge.

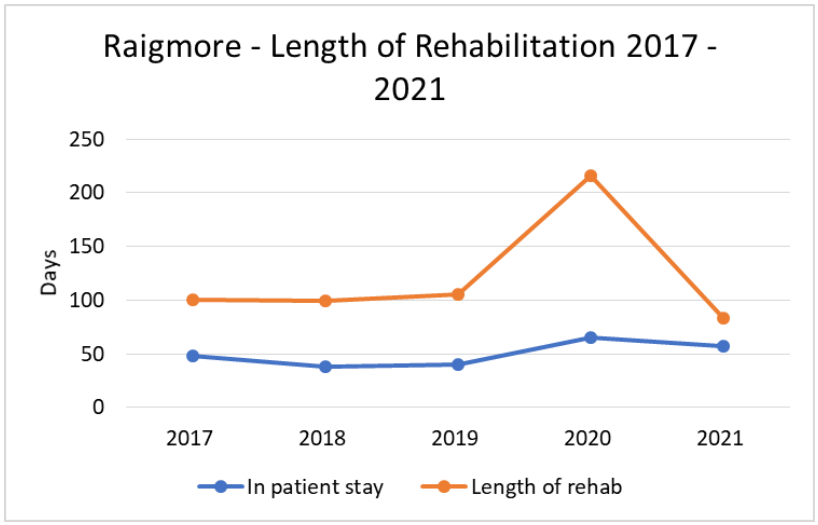
MOC = 8/11

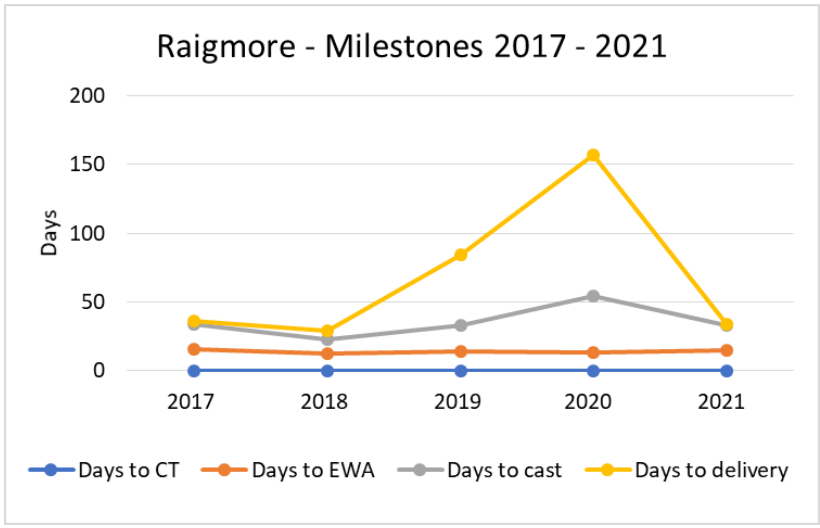
COVID Challenges	2020	2021
Rehabilitation Beds	Early inpatient discharge initially, no inpatient beds available for inpatient prosthetic rehabilitation	Prosthetic rehabilitation delivered as in-patient service
Specialist staff	Specialist staff providing inpatient service	Specialist staff available
Rehabilitation area	Limited space in Gym as it was used as a storage area	Gym facilities available
Prosthetic service	Raigmore (service on-site) – Primaries were prioritised for casting but delays in delivering prosthetic limbs.	Staffing issues – locum employed, and prosthetic sockets manufactured off site
Outpatient service	Minimal inpatient rehabilitation, majority of patients' limb fitted as outpatients. Challenges providing outpatient service due to geographical area and social distancing. Community referrals to Non-specialist staff.	Gradual return to pre-COVID service, within limitations of COVID guidelines and social distancing. Specialist staff providing outpatient service.

5-year milestone data following Unilateral Transtibial Amputation (2017 – 2021)

Raigmore Hospital – Unilateral Transtibial Milestones							
	Limb-fitted N (%)	Days to CT	Days to EWA	Days to cast	Days to delivery	In patient stay	Length of rehab
2017	11 (69%)	0	15.5	34	36	48.5	100
2018	10 (53%)	0	12.5	22.5	29	37.5	99
2019	15 (68%)	0	14	33	84	40.5	105
2020	14 (58%)	0	13	54.5	157	65.5	216
2021	17 (59%)	0	15	33	34	57	83

CT – Compression Therapy, EWA – Early Walking Aid.





9.1.7 Ninewells Hospital, NHS Tayside

- Immediate post-operative rigid dressings are routinely used (2).
- Following an amputation, patients at Ninewells Hospital will receive treatment from a specialist physiotherapist (2).
- As an in-patient, physiotherapy will take the form of one-to-one sessions, based mainly in the therapy gym. Patients will routinely receive one treatment session daily (2), Monday to Friday, and post fitting if workload allows a second session (daily physio 45 minutes on average)
- The Prosthetic service is delivered on site at TORT (1).
- Some patients discharged home after prosthetic fitting (1).
- Prosthetic candidates are discharged home when medically fit. A new Outreach service supports early discharge and provides a link between Inpatient and community services. Access to specialist out-patient physiotherapy, if required. (1)
- Patients, who are not appropriate for prosthetic fitting, will receive the same level of in-patient input, but do not routinely access physiotherapy on discharge.

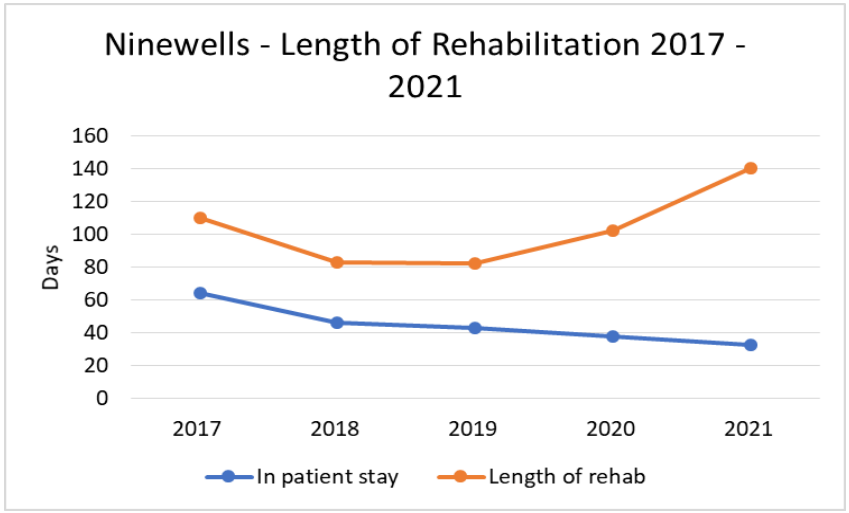
MOC=9/11

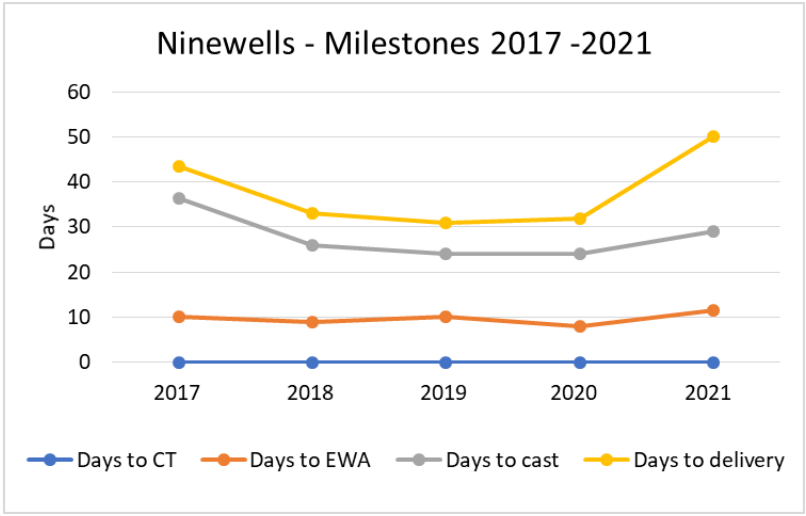
COVID Challenges	2020	2021
Rehabilitation Beds	Ten amputee rehabilitation beds lost due to bed pressures	Rehabilitation beds lost permanently
Specialist staff	Unchanged specialist staff delivering service	Unchanged specialist staff delivering service
Rehabilitation area	Moved to temporary gym space for short time initially	Gym operating within social distancing guidelines
Prosthetic service	TORT on site – Primary patients prioritised	TORT - prosthetic services open but operating at reduced capacity due to social distancing
Outpatient service	New Outreach service set up, delivering service to patients within their own home.	Outreach service continued; some patients may also attend Ninewells for outpatient rehab, within COVID guidelines

5-year milestone data following Unilateral Transtibial Amputation (2017 – 2021)

Ninewells Hospital – Unilateral Transtibial Milestones							
	Limb-fitted N (%)	Days to CT	Days to EWA	Days to cast	Days to delivery	In patient stay	Length of rehab
2017	20 (71%)	0	10	36.5	43.5	64	110
2018	41 (84%)	0	9	26	33	46	83
2019	34 (81%)	0	10	24	31	43	82
2020	41 (85%)	0	8	24	32	38	102
2021	41 (80%)	0	11.5	29	50	33	140

CT – Compression Therapy, EWA – Early Walking Aid.





9.1.8 Queen Elizabeth University Hospital (QEUH), NHS Greater Glasgow & Clyde

- Immediate post-operative rigid dressings are not routinely used
- Following an amputation, patients at QEUH will receive treatment from a specialist physiotherapist (2).
- As an in-patient, physiotherapy will be provided in one-to-one and group sessions, based on the ward and in a therapy gym. Patients will routinely receive one treatment session daily (2), Monday to Friday, with an average treatment session lasting 60 minutes (1).
- The Prosthetic service is delivered on site at WESTMARC (1).
- Patients who are appropriate for prosthetic input will be routinely discharged after casting for their prosthetic limb. However, if there are access difficulties at home some are kept in until they are mobilising with their prosthesis (1).
- Patients who are appropriate for prosthetic input will have access to out-patient physiotherapy follow-up at WestMARC, their nearest limb-fitting centre. They will see a specialist physiotherapist (1) twice a week and have access to community outreach, clinical psychology and specialist OT services.
- Patients, who are not appropriate for prosthetic fitting, will receive the same level of in-patient input, but do not routinely access physiotherapy on discharge.

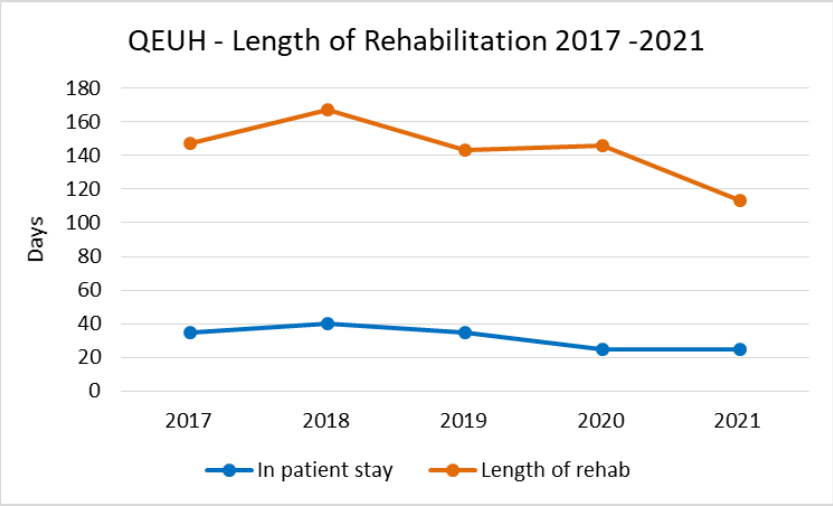
MOC=8/11

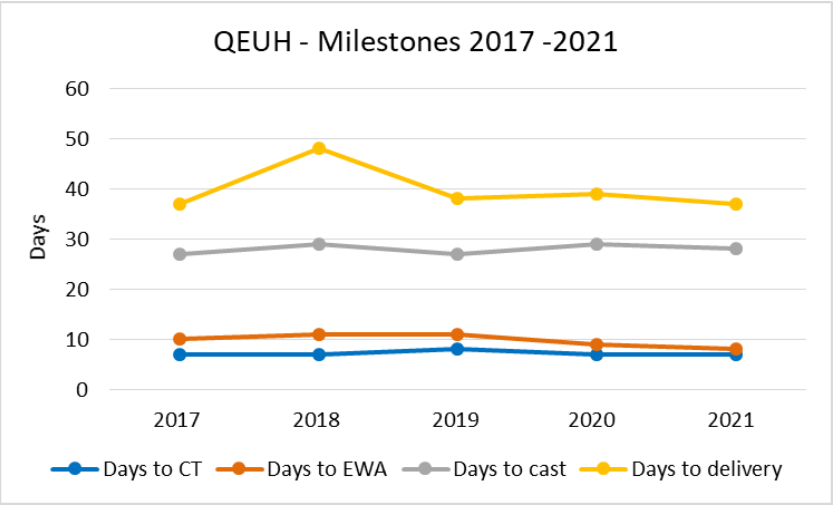
COVID Challenges	2020	2021
Rehabilitation Beds	Reduced in patient stay	Reduced pressures for early discharge
Specialist staff	Some staff redeployed to critical care	Specialist staff returned
Rehabilitation area	Gym closed, all interventions in patient's room	Gym open but operating at reduced capacity due to social distancing
Prosthetic service	WestMARC (on-site) -Primary patients prioritised	WestMARC prosthetic services open but operating at reduced capacity due to social distancing
Outpatient service	Delivered by WestMARC, 1:1 treatment sessions, Near Me consultations, Home Visits	On-going service delivery with restrictions due to social distancing.

5-year milestone data following Unilateral Transtibial Amputation (2017 – 2021)

Queen Elizabeth University Hospital – Unilateral Transtibial Milestones							
	Limb-fitted N (%)	Days to CT	Days to EWA	Days to cast	Days to delivery	In patient stay	Length of rehab
2017	43 (63%)	7	10	27	37	35	147
2018	47 (67%)	7	11	29	48	40	167
2019	43 (58%)	8	11	27	38	35	143
2020	54 (60%)	7	9	29	39	25	146
2021	76 (80%)	7	8	28	37	25	113

CT – Compression Therapy, EWA – Early Walking Aid.





Please note the above data refers to the patients who remained in GG&C for their rehabilitation journey

9.1.9 Forth Valley Royal Hospital, NHS Forth Valley

- Immediate post-operative rigid dressings are not routinely used
- Since early 2019 all patients will have their amputation surgery at QEUH, receiving treatment from a specialist physiotherapist (1) until they are repatriated to Forth Valley. Physiotherapy sessions will be delivered by non-specialist physiotherapists in several areas of FVRH
- As an in-patient, in QEUH, physiotherapy will be provided in one-to-one and group sessions, based on the ward and in a therapy gym. Patients will routinely receive one treatment session daily, Monday to Friday, with an average treatment session lasting 60 minutes.
- Once repatriated to FVRH, at 7 – 10 days, the frequency and length of treatment sessions varies depending on location and resources (1).
- The Prosthetic service is delivered at WESTMARC.
- Patients who are appropriate for prosthetic input will be routinely discharged home before attending WestMARC.
- Patients who are appropriate for prosthetic input will have access to out-patient physiotherapy follow-up at Bellfield Centre, they will see a specialist physiotherapist (1) once a week.
- Patients, who are not appropriate for prosthetic fitting, will receive the same level of in-patient input, but do not routinely access physiotherapy on discharge.

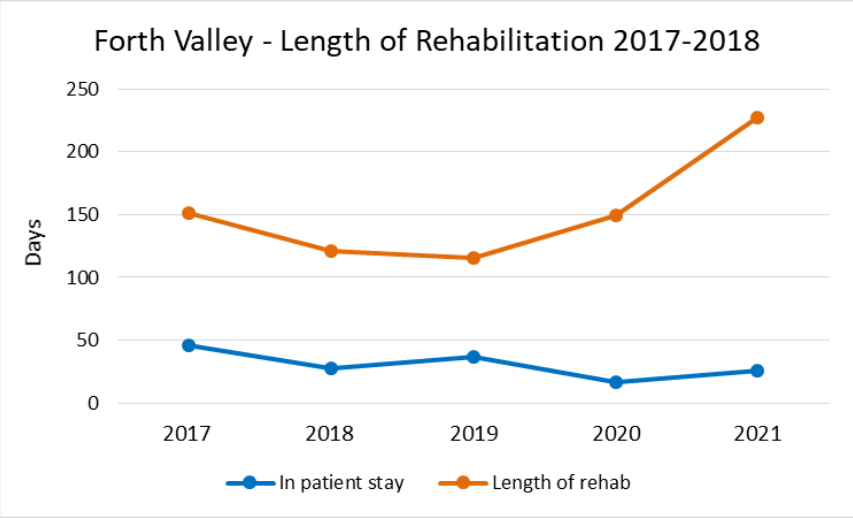
MOC=3/11

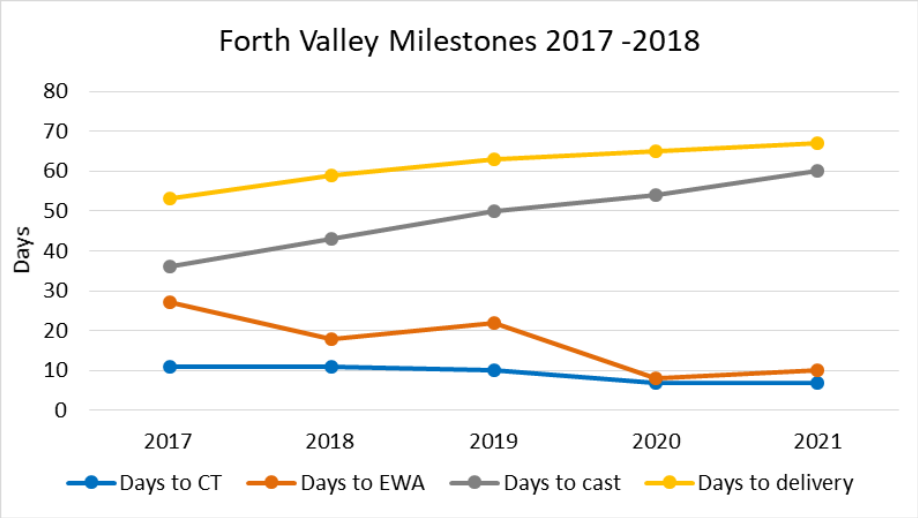
COVID Challenges	2020	2021
Rehabilitation Beds	Surgery at QEUH, repatriated to unspecified wards	Surgery at QEUH, repatriated to rehab unit once medically stable
Specialist staff	None as patients in multiple areas	Specialist staff in rehabilitation unit
Rehabilitation area	No gym area	Gym area in rehabilitation ward/ outpatient setting
Prosthetic service	WestMARC – primary patients prioritised	WestMARC prosthetic services open but operating at reduced capacity due to social distancing
Outpatient service	Delivered by staff in WestMARC , 1:1 treatment sessions, Near Me consultations, Home visits	Outpatient class operating on a Monday, with restrictions due to social distancing.

5-year milestone data following Unilateral Transtibial Amputation (2017 – 2021)

Forth Valley Royal Hospital – Unilateral Transtibial Milestones							
	Limb-fitted N (%)	Days to CT	Days to EWA	Days to cast	Days to delivery	In patient stay	Length of rehab
2017	10 (44%)	11	27	36	53	46	151
2018	11 (48%)	11	18	43	59	28	121
2019	21 (72%)	10	22	50	63	37	116
2020	6 (40%)	7	8	54	65	17	200
2021	13 (76%)	7	10	60	67	26	227

CT – Compression Therapy, EWA – Early Walking Aid.





Please note from February 2019, the above data refers to the patients who were repatriated from QEUH to Forth Valley to complete their rehabilitation journey. Compression therapy and use of EWA would, in the majority of cases, be initiated at QEUH.

9.1.10 Vascular Centralisation in Scotland

In early 2019, the vascular unit at Forth Valley Royal Hospital (FVRH) moved to Queen Elizabeth University Hospital (QEUH). Following this all patients requiring amputation surgery, which had previously been performed in FVRH, were transferred to QEUH, and then repatriated to FVRH, to continue their rehabilitation. The majority of patients, who were assessed for limb -fitting commenced compression therapy (CT) and early walking aid (EWA) use while at QEUH (7 -10 days post-surgery) prior to repatriation.

In 2022, further centralisation of vascular services resulted in patients from both Ayrshire and Dumfries and Galloway being transferred to the University Hospital Hairmyres for surgery, before being repatriated to their own Health Board post operatively. This will be reported with the 2022 data.

Figure 6 show demonstrates the significant variation in days to cast, days to delivery, length of inpatient stay and length of rehabilitation between the 2 pathways, since centralisation in 2019 (2019 – 2021).

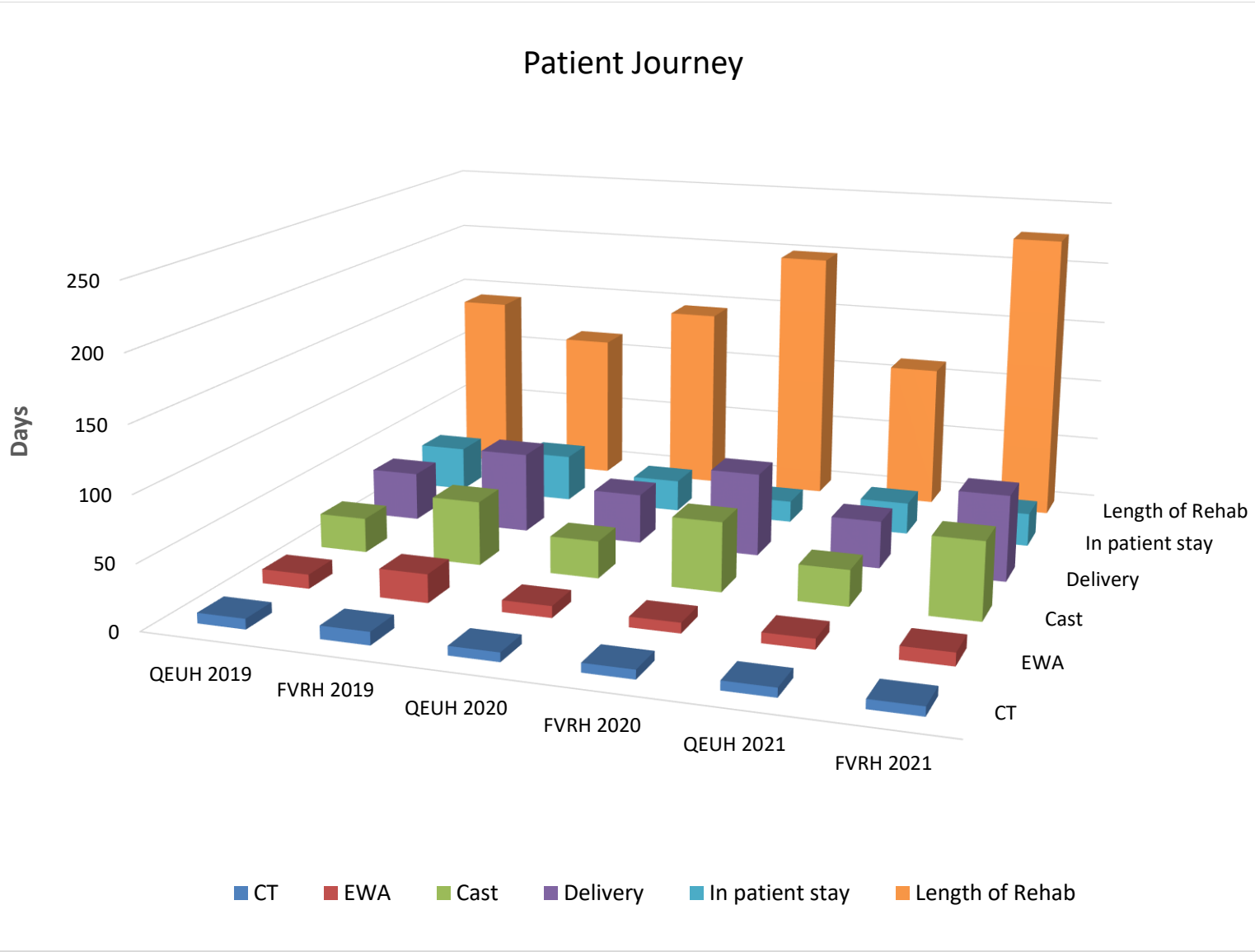


Figure 6 **Rehabilitation milestones for the QEUH and FVRH pathways for 2019 -2021**

9.1.11 University Hospital Hairmyers, NHS Lanarkshire

- Immediate post-operative rigid dressings are not routinely used
- Following an amputation, patients at Hairmyres Hospital will receive treatment from a specialist physiotherapist (2).
- As an in-patient, physiotherapy will be provided in one-to-one and group sessions, based on the ward and in a therapy gym. Patients will routinely receive one treatment session daily Monday to Friday (3 ward sessions and 2 gym sessions) (1), with an average Gym treatment session lasting 60 minutes and the ward session, 45 minutes (1).
- The Prosthetic service is delivered at WESTMARC.
- Patients who are appropriate for prosthetic-fitting will routinely be discharged before primary prosthetic review.
- Patients who are appropriate for prosthetic input will have access to routine out-patient physiotherapy follow-up at their nearest acute hospital. They will see a specialist physiotherapist (1) twice a week in a group exercise setting.
- Patients, who are not appropriate for prosthetic fitting, will receive the same level of in-patient input, but do not routinely access physiotherapy on discharge. This will be provided via a domiciliary service.

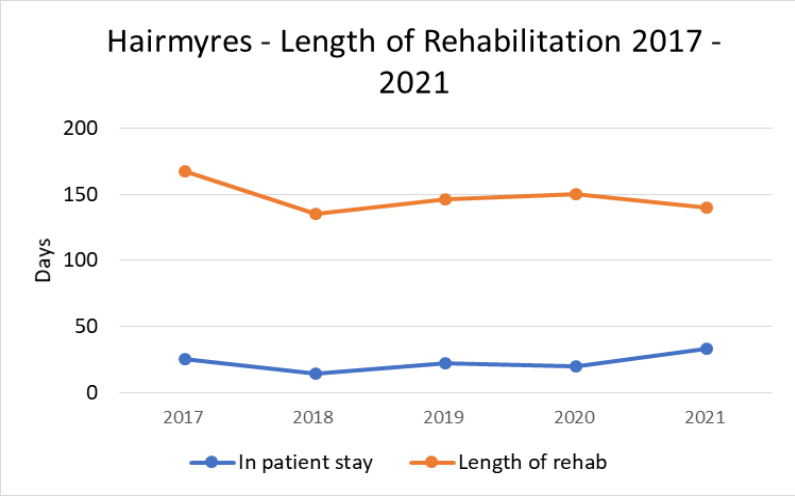
MOC= 5/11

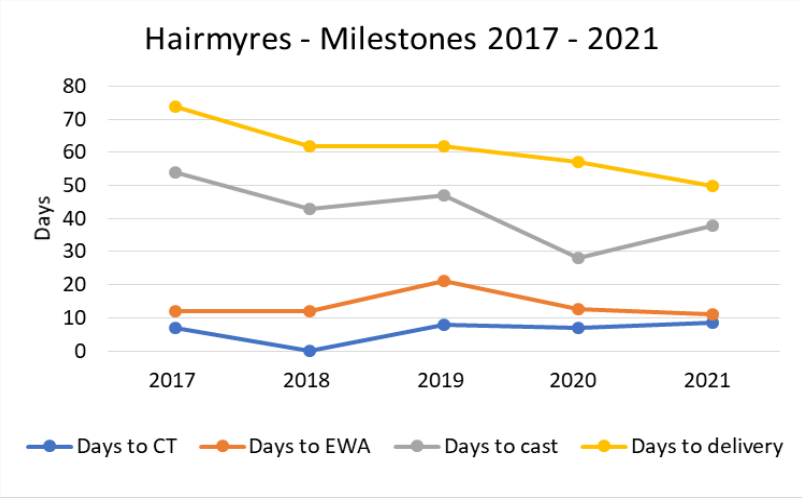
COVID Challenges	2020	2021
Rehabilitation Beds	Early discharge due to bed pressures	Slow improvement with intermittent bed pressures, leading to early discharge
Specialist staff	Staff deployed to critical care; links established with WestMARC	Intermittent redeployment of special staff to cover critical care
Rehabilitation area	Gym space unavailable until autumn	Gym space available
Prosthetic service	WestMARC – primary patients prioritised	WestMARC prosthetic services open but operating at reduced capacity due to social distancing
Outpatient service	From April to August service delivered by WestMARC, 1:1 treatment sessions and Near Me consultations.	Out-patient service delivered with restrictions due to social distancing.

5-year milestone data following Unilateral Transtibial Amputation (2017 – 2021)

University Hospital Hairmyres – Unilateral Transtibial Milestones							
	Limb-fitted N (%)	Days to CT	Days to EWA	Days to cast	Days to delivery	In patient stay	Length of rehab
2017	29 (81%)	7	12	54	74	25	167.5
2018	17 (65%)	0	12	43	62	14	135
2019	27 (51%)	8	21	47	62	22	146
2020	19 (58%)	7	12.5	28	57	20	150
2021	21 (66%)	8.5	11	38	50	33	140

CT – Compression Therapy, EWA – Early Walking Aid.





10 Individual Hospital Summaries for 2021

10.1 Data Checking Summary

This section presents the national data broken down by amputating hospital; please refer to Section 9; further information on each service's model of care.

The number of amputees at each hospital and the data completeness are shown in Table 48, 2020 and 2021.

Table 48 Data Checking Summary by Hospital, 2020 & 2021

	Forms issued (n=)		Forms missing (n=)		Forms complete(n=)		Forms Incomplete (n=)	
Hospital	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**	**2020**	**2021**
Aberdeen Royal Infirmary	71	99	71	99	0	0	0	0
University Hospital Ayr	49	51	0	0	49	51	0	0
Borders General Hospital	0	0	0	0	0	0	0	0
Dumfries & Galloway Royal Infirmary	17	16	0	0	17	16	0	0
Forth Valley Royal Hospital	3	0	0	0	3	0	0	0
Glasgow Royal Infirmary	15	12	0	0	15	12	0	0
Golden Jubilee National Hospital	2	7	0	0	2	7	0	0
University Hospital Hairmyres	92	95	0	0	92	95	0	0
University Hospital Monklands	0	0	0	0	0	0	0	0
Ninewells Hospital	121	106	0	0	121	106	0	0
Raigmore Hospital	35	46	0	0	33	45	2	1
Royal Alexandria Hospital	0	6	0	0	0	6	0	0
Royal Infirmary of Edinburgh	143	112	0	0	143	112	0	0
Queen Elizabeth University Hospital	198	212	0	0	196	209	2	3
St John's Hospital	1	2	0	0	1	2	0	0
University Hospital Wishaw	1	5	0	0	1	5	0	0
Woodend Hospital	4	4	4	4	0	0	0	0
Inverclyde	0	1	0	0	0	1	0	0
Outside Scottish Service	0	0	0	0	0	2	0	0
National	**752**	**776**	**75**	**103**	**673**	**669**	**4**	**4**

10.2 Key Performance Indicators by Hospital

Tables 49 to 53 only include those centres with > 10 amputation surgeries in 2020 and 2021. This is to ensure data protection and validity of data analysis.

10.2.1 Age and FCI

Table 49 Median Age, and FCI, 2020 & 2021

Hospital	Median Age (years)		Mean FCI	
	2020	2021	2020	2021
Aberdeen Royal Infirmary	**	**	**	**
University Hospital Ayr	71	67	3.2	3.3
Dumfries & Galloway Royal Infirmary	71	75	2.5	3.0
Glasgow Royal Infirmary	63	54	2.4	1.8
University Hospital Hairmyres	68	67	2.5	2.2
Ninewells Hospital	70	66	3.1	2.6
Queen Elizabeth University Hospital	65	65	2.6	2.9
Raigmore Hospital	73	72	3.7	3.5
Royal Infirmary of Edinburgh	68	68	2.7	3.0
National	68	66	2.8	2.8

Abbreviations: FCI = Functional Co-morbidities Index (Appendix E)

10.2.2 Final Level of Amputation

The final level of Amputation at end of the rehabilitation period is recorded in Table 50, 2020 and 2021.

Table 50 Final level of Amputation at end of Rehabilitation by Hospital, 2020 & 2021

Hospital	Unilateral TTA % (n)		Unilateral TFA % (n)		Other % (n)		Bilateral TTA %(n)		Bilateral TFA % (n)		TTA & TFA%(n)		Other % (n)		Total % (n)	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Aberdeen Royal Infirmary	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**
University Hospital Ayr	42.9 (21)	27.5 (14)	34.7 (17)	51 (26)	0	2 (1)	8.2 (4)	3.9 (2)	6.1 (3)	5.9 (3)	6.2 (4)	9.8 (5)	0	0	100 (49)	100 (51)
Dumfries & Galloway Royal Infirmary	11.8 (2)	43.8 (7)	41.2 (7)	37. 5 (6)	0	0	23.5 (4)	0	11.8 (2)	12.5 (2)	5.9 (1)	6.3 (1)	5.9 (1)	0	100 (17)	100 (16)
Glasgow Royal Infirmary	80 (12)	75 (9)	13.3 (2)	25 (3)	0	0	6.7 (1)	0	0	0	0	0	0	0	100 (15)	100 (12)
University Hospital Hairmyres	35.9 (33)	33.7 (32)	46.7 (43)	50.5 (48)	1.1 (1)	1.1 (1)	6.5 (6)	4.2 (4)	6.5 (6)	6.3 (6)	2.2 (2)	3.2 (3)	1.1 (1)	1.1 (1)	100 (92)	100 (95)
Ninewells Hospital	39.7 (48)	48.1 (51)	38.8 (47)	33 (35)	0.8 (1)	0	9.1 (11)	8.5 (9)	6.6 (8)	7.5 (8)	3.3 (4)	2.8 (3)	1.7 (2)	0	100 (121)	100 (106)
Queen Elizabeth University Hospital	48.5 (96)	48.6 (103)	37.9 (75)	34.4 (73)	1.5 (3)	0.5 (1)	7.1 (14)	6.6 (14)	3 (6)	6.6 (14)	1.5 (3)	3.3 (7)	0.5 (1)	0	100 (198)	100 (212)
Raigmore Hospital	68.6 (24)	56.5 (26)	22.9 (8)	26.1 (12)	2.9 (1)	0	5.7 (2)	10.9 (5)	0	4.3 (2)	0	2.2 (1)	0	0	100 (35)	100 (46)
Royal Infirmary of Edinburgh	37.8 (54)	41.1 (46)	41.3 (59)	37.5 (42)	2.7 (4)	0.9 (1)	5.6 (8)	7.1 (8)	7.7 (11)	11.6 (13)	4.9 (7)	1.8 (2)	0	0	100 (143)	100 (112)
National	43.3 (293)	44.4 (29)	38.4 (260)	37 (249)	1.6 (11)	0.9 (6)	7.5 (51)	6.8 (46)	5.3 (36)	7.3 (49)	3.1 (21)	3.4 (23)	0.7 (5)	0.1 (1)	100 (677)	100 (673)

Abbreviations: TFA=transfemoral, TTA=transtibial

10.2.3 Final Outcome

Final outcome (at discharge from physiotherapy) by hospital are shown in Table 51, 2020 and 2021.

Table 51 Key Performance Indicators by Hospital, 2020 & 2021

Hospital	LF % (n)		NLF% (n)		Abandoned % (n)		Died % (n)		Total (n)	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
Aberdeen Royal Infirmary	**	**	**	**	**	**	**	**	71	99
University Hospital Ayr	40.8 (20)	33.3 (17)	38.8 (19)	47.1 (24)	2 (1)	5.9 (3)	18.4 (9)	13.7 (7)	49	51
Dumfries & Galloway Royal Infirmary	23.5 (4)	43.8 (7)	47.1 (8)	25 (4)	11.8 (2)	0	17.6 (3)	31.3 (5)	17	16
Glasgow Royal Infirmary	73.3 (11)	83.3 (10)	26.7 (4)	16.7 (2)	0	0	0	0	15	12
University Hospital Hairmyres	29.3 (27)	37.9 (36)	59.8 (55)	45.3 (43)	0	1.1 (1)	10.9 (10)	15.8 (15)	92	95
Ninewells Hospital	48.8 (59)	50 (53)	37.2 (45)	34 (36)	0	1.9 (2)	14 (17)	14.2 (15)	121	106
Queen Elizabeth University Hospital	39.9 (79)	47.6 (101)	43.4 (86)	38.2 (81)	5.6 (11)	3.3 (7)	11.1 (22)	10.8 (23)	198	212
Raigmore Hospital	45.7 (16)	50 (23)	48.6 (17)	28.3 (13)	0	2.2 (1)	5.7 (2)	19.6 (9)	35	46
Royal Infirmary of Edinburgh	30.8 (44)	40.2 (45)	53.1 (76)	52.7 (59)	2.1 (3)	0	14 (20)	7.1 (8)	143	112
National	39 (264)	45.2 (304)	46.1 (312)	40.3 (271)	2.5 (17)	2.2 (15)	12.4 (84)	12.3 (83)	677	673

Abbreviations: LF=Limb-fitted, NLF=non-Limb-fitted

10.3 Milestones by hospital (limb-fitted unilateral transtibial amputees)

The number of, and milestones data for limb-fitted unilateral transtibial amputees are presented for each hospital in Table 52, 2020 and 2021.

Table 52 Key Performance Indicators (milestones) by hospital, 2020 & 2021

Hospital	Number of unilateral TTA		% Limb Fitted		Days to CT		Days to EWA		Days to Casting		Days to Delivery	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
University Hospital Ayr	21	14	67% (n=14)	50% (n=7)	11	12	26	16	54	45	69	57
Dumfries & Galloway Royal Infirmary	2	7	0	57% (n=4)	0	8	0	10	0	34	0	41
Glasgow Royal Infirmary	12	9	75% (n=9)	89% (n=8)	14	13.5	45	18.5	61	32.5	68	39.5
University Hospital Hairmyres	33	32	58% (n=19)	66% (n=21)	7	8.5	12.5	11	28	38	57	50
Ninewells Hospital	48	51	85% (n=41)	80% (n=41)	0	0	8	11.5	24	29	32	50
Queen Elizabeth University Hospital	96	103	63% (n=60)	72% (n=74)	7	7	8.5	8	29	29.5	42	40
Raigmore Hospital	24	26	58% (n=14)	59% (n=17)	0	0	13	15	54.5	33	157	34
Royal Infirmary of Edinburgh	54	46	50% (n=27)	57% (n=26)	11	8.5	31	25.5	70	52.5	76	63
National Median	377	299	49% n= 185	69% (n=207)	7	7	12	12	38	35	51	46

Abbreviations: Transtibial Amputation (TTA), Compression therapy (CT), Early Walking Aid (EWA).

Definitions:

Days to CT	Median days from final surgery to start of compression therapy.
Days to EWA	Median days from final surgery to start of early walking aid therapy e.g., PPAM aid.
Days to casting	Median days from final surgery to casting for prosthesis.
Days casting to delivery	Median days from final surgery to delivery of prosthesis

Table 53 Key Performance Indicators (milestones) by hospital, 2020 & 2021

Hospital	Number of unilateral TTA		% Limb Fitted		In Patient Stay		Overall Length of Rehab		LCI-5 change score	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
University Hospital Ayr	21	14	67% (n=14)	50% (n=7)	20	24	231.5	190	-12.5	-7
Dumfries & Galloway Royal Infirmary	2	7	0	57% (n=4)	0	76	0	115.5	0	-7
Glasgow Royal Infirmary	12	9	75% (n=9)	89% (n=8)	37	7.5	252	94	-7.5	-2.5
University Hospital Hairmyres	33	32	58% (n=19)	66% (n=21)	20	33	150	140	-10.5	-13
Ninewells Hospital	48	51	85% (n=41)	80% (n=41)	38	44	102	115	0	-13
Queen Elizabeth University Hospital	96	103	63% (n=60)	72% (n=74)	23	25.5	146	118	-7	-3
Raigmore Hospital	24	26	58% (n=14)	59% (n=17)	65.5	57	216	83	-13	-13
Royal Infirmary of Edinburgh	54	46	50% (n=27)	57% (n=26)	71	72.5	170	164	-10	-7.5
National Median	**377**	**299**	**49% (n= 185)**	**69% (n=207)**	**32**	**38**	**148**	**119**	**-7**	**-9**

Abbreviations: Transtibial Amputation (TTA), LCI-5 see section 5.3, note a positive score is an improvement and a negative score demonstrates a deterioration, in community mobility, post amputation.
Definitions:
In Patient Stay Median days from amputation surgery to discharge from inpatient care
Overall Length of Rehab Median days from amputation surgery to discharge from outpatient care.

11 References

1 Hebenton J, Scott H, Davie-Smith F, Seenan C. Relationship between models of care and key rehabilitation milestones following unilateral transtibial amputation: a national cross-sectional study. *Physiother (United Kingdom)* 2019;**105**(4):476–82.

2 Scott H, Patel R. Benchmarking Primary Lower Limb Amputee Services for Years 2004, 2005 and 2006.' ScotRET Prosthetics Service Group. 2009.

3 Condie E, Scott H, Treweek S. Lower Limb Prosthetic Outcome Measures: A Review of the Literature 1995 to 2005. *JPO J Prosthetics Orthot* 2006;**18**(Proceedings):P13–45. Doi: 10.1097/00008526-200601001-00004.

4 Franchignoni F, Giordano A, Ferriero G, Muñoz S, Orlandini D, Amoresano A. Rasch analysis of the locomotor capabilities index-5 in people with lower limb amputation. *Prosthet Orthot Int* 2007;**31**(4):394–404. Doi: 10.1080/03093640701253952.

5 Franchignoni F, Orlandini D, Ferriero G, Moscato TA. Reliability, validity, and responsiveness of the locomotor capabilities index in adults with lower-limb amputation undergoing prosthetic training. *Arch Phys Med Rehabil* 2004;**85**(5):743–8. Doi: 10.1016/j.apmr.2003.06.010.

6 Davie-Smith F, Hebenton J, Scott H. https://bacpar.csp.org.uk/publications/sparg-report-2016. SPARG. https://bacpar.csp.org.uk/publications/sparg-report-2016%0A. 08/20/2019.

12 Appendices

12.1 *Appendix A Bibliography & Research*

Ross M, Ramsay C, Geddes S and Davie-Smith F (2022) 'Exercise Intervention for the Treatment of Patients with Intermittent Claudication' Scottish Physiotherapy Amputee Research Group, Glasgow. (www.bacpar.org/data/Resource_Downloads/IntermittentClaudicationguideline2022.pdf)

Lee, J., Davie-Smith, F., Hebenton, J., Sharp, K. and Seenan, C., 2022. Impact of PPAM aid use on the time to prosthetic limb delivery in patients with unilateral transtibial amputation: a retrospective analysis. Prosthetics and Orthotics International, pp.10-1097.

Crane, H., Boam, G., Carradice, D., Vanicek, N., Twiddy, M. and Smith, G.E., 2021. Through-knee versus above-knee amputation for vascular and non-vascular major lower limb amputations. Cochrane Database of Systematic Reviews, (12).

Hebenton, J., Scott, H., Seenan, C. and Davie-Smith, F., 2019. Relationship between models of care and key rehabilitation milestones following unilateral transtibial amputation: a national cross-sectional study. Physiotherapy, 105(4), pp.476-482.

Davie-Smith, F., Paul, L., Stuart, W., Kennon, B., Young, R. and Wyke, S., 2019. The influence of socio-economic deprivation on mobility, participation, and quality of life following major lower extremity amputation in the West of Scotland. European Journal of Vascular and Endovascular Surgery, 57(4), pp.554-560.

Davie-Smith, F., Coulter, E., Kennon, B., Wyke, S. and Paul, L., 2017. Factors influencing quality of life following lower limb amputation for peripheral arterial occlusive disease: A systematic review of the literature. Prosthetics and Orthotics International, 41(6), pp.537-547.

Davie-Smith, F., Paul, L., Nicholls, N., Stuart, W.P. and Kennon, B., 2017. The impact of gender, level of amputation and diabetes on prosthetic fit rates following major lower extremity amputation. Prosthetics and orthotics international, 41(1), pp.19-25.

Hebenton, J., Colvin, J., Seenan, C. and Scott, H., 2016. Early PPAM aid use post-unilateral transtibial amputation is associated with reduced time to prosthetic fitting and finishing rehabilitation. Physiotherapy, 102, pp.e147-e148.

12.2 *Appendix B Aetiology Mapping*

Definition

If there are several factors contributing to the patient's need for an amputation, the main or root cause of the amputation will be selected here, other factors are included as co-morbidities using FCI.

- PAD – Peripheral Arterial Disease this terminology replaces the previously used "Peripheral Vascular Disease".
- Diabetes. If patient is diabetic enter as aetiology unless tumour, trauma, burns, drug abuse or orthopaedic is the cause. The amputation may be the result of PAD and/or neuropathy and/or renal failure.
- Blood borne infection includes meningitis
- Renal Failure – only where diabetes is not present
- Other for any aetiology not listed.

Since 2016 **'immediate cause of amputation'** has been included. This is either infection, ischaemia or a combination of both and will be secondary to aetiology. This section may not be applicable when amputation is due to trauma, tumour or congenital deformity in which case mark as not applicable.

Mapping

The list of aetiologies used in this report was revised and reduced in 2004 and revised again in 2016 in order to improve accuracy of recording and relevance of categories. The following shows the mapping of the previous list of aetiologies to the current list.

Previous category	New category 2004	2016
PAD – Arteriosclerosis	Unchanged	Unchanged
PAD – Diabetes	Diabetes	Unchanged
Trauma	Trauma or Burns	Unchanged
Burns		
Tumour	Unchanged	Unchanged
Congenital deformity	Unchanged	Unchanged
Drug abuse	Unchanged	Unchanged
Venous Problems	Venous disease	Unchanged
Non-union of fracture	Orthopaedic	Non-union of fracture
Failed joint replacement		Failed joint replacement
Acquired deformity		Acquired deformity
Septicaemia	Blood-borne infection	Unchanged
Renal Problems	Renal Failure	Unchanged
Other	Other	Chronic regional pain Syndrome
Local Infection		Acute vascular incident
Not recorded	Unchanged	Not recorded

12.3 *Appendix C Locomotor Capabilities Index 5*

Only fill this in for amputees who are using their prosthesis to WALK.

Please note: this assessment must be completed ***with the amputee present or on the telephone*** and the amputee ***must be asked*** how they think they can manage each activity. It is how the patient perceives their own performance that is being measured.

Put 0,1,2,3 or 4 in the appropriate boxes where: -

0. = No
1. = Yes, if someone helps
2. = Yes, if someone is near
3. = Yes, alone with walking aid(s)
4. = Yes, alone **without** walking aid

Activity	**6 months pre-admission**	**Final Discharge**
Basic Activities		
Get up from a chair		
Walk indoors		
Walk outside on even ground		
Go up the stairs with a hand-rail		
Go down the stairs with a hand-rail		
Step up a kerb		
Step down a kerb		
TOTAL		
Advanced activities		
Pick up an object from the floor when standing		
Get up from the floor (e.g. after a fall)		
Walk outside on uneven ground (e.g. grass, gravel, slope)		
Walk outside in bad weather (e.g. rain, wind, snow)		
Go up a few steps without a hand-rail		
Walk down without a hand-rail		
Walk while carrying an object		
TOTAL		
OVERALL TOTAL		
CHANGE of overall total from 6 months preadmission to final discharge		

12.4 *Appendix D Functional Co-morbidities Index*

Lower limb amputees are a predominantly elderly group with a relatively high incidence of co-morbid disease. This has not been previously accounted for in the SPARG data collection and analysis. The Functional Co-morbidities Index (FCI) was incorporated into the data set from 2008.

The FCI was developed and validated with physical function as the outcome (Groll et al 2005). The more commonly used indices predict mortality or administrative outcomes such as hospital length of stay. These indices tend to include conditions that are asymptomatic and impact on life expectancy but not physical function (for example, hypertension) and have been found not to correlate strongly with physical disability.

The FCI was developed using 2 different samples of adults: 1 group n= 9,423 'random Canadian adults'; 2nd group n = 28,349 'US adults seeking treatment for spinal ailments' using the physical subscale of the SF36 as the outcome.

The FCI is completed by scoring a 1 if a disease is present and 0 if it is not. A score of 0 indicates no co-morbid illness and a score of 18 indicates the highest number of co-morbid illnesses. The disease is only scored as present if it is diagnosed and documented in medical notes.

The BMI is calculated for each patient by dividing the patient's weight by their height in metres squared (weight / height $^{2)}$. If neither height nor weight cannot be measured or obtained, BMI can be estimated using the mid upper arm circumference (MUAC) ('Must' Explanatory Booklet). If MUAC is more than 32.0cm, BMI is likely to be more than 30kg/m^2 i.e. patient is likely to be obese.

Functional Co-morbidities Index

Arthritis (rheumatoid and osteoarthritis)	Yes		No	
Osteoporosis	Yes		No	
Asthma	Yes		No	
Chronic Obstructive Pulmonary Disease, Acquired Respiratory Distress Syndrome, Emphysema	Yes		No	
Angina	Yes		No	
Congestive Heart Failure (or heart disease)	Yes		No	
Heart Attack (myocardial infarction)	Yes		No	
Neurological disease e.g. Multiple Sclerosis or Parkinson's	Yes		No	
CVA or TIA	Yes		No	
Peripheral Arterial Disease	Yes		No	
Diabetes Type I and II	Yes		No	
Upper gastrointestinal disease (ulcer, hernia, reflux)	Yes		No	
Depression	Yes		No	
Anxiety or panic disorders	Yes		No	
Visual impairment (cataracts, glaucoma, macular degeneration)	Yes		No	
Hearing impairment (very hard of hearing even with hearing aids)	Yes		No	
Degenerative disc disease including, back disease, spinal stenosis or severe chronic back pain	Yes		No	
Obesity and/or BMI > 30 (Pre-op weight in Kg/height in metres $^{2)}$				
Weight …… (Kg)	Yes		No	
Height …….. (metres) BMI = ……				
Please see Guidance Notes **Score** (Yes = 1, No = 0)	/ 18			

For further information please contact:

Joanne Hebenton, SPARG Chair - Joanne.hebenton@ggc.scot.nhs.uk