National Diabetes Foot Care Audit
Third Annual Report

England and Wales
14 July 2014 to 31 March 2017

NHS Digital

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14 March 2018

Introduction: Contents

Key

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Introduction: Summary

- The National Diabetes Foot Care Audit (NDFA) is a measurement system of care structures, patient management and the outcomes of care for people with active diabetic foot ulcers.
- The NDFA is part of the National Diabetes Audit (NDA) portfolio within the National Clinical Audit and Patient Outcomes Programme (NCAPOP), commissioned by the Healthcare Quality Improvement Partnership (HQIP).
- Data on patient care can be submitted from any healthcare provider treating diabetic foot ulcers. Data on care structures can be submitted from any commissioner.
- Explicit consent to participate was given before any patient data was collected. From August 2017 participation in the audit is mandatory and patient consent is no longer required in England. Patients in Wales must still be consented.
- The audit collects data on patients and services in England and Wales. Collection started on 14 July 2014.

Prepared in collaboration with:

HQIP
Healthcare Quality Improvement Partnership

NHS Digital

DIABETES UK
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Public Health England

Introduction: Why is diabetic foot care important?[1]

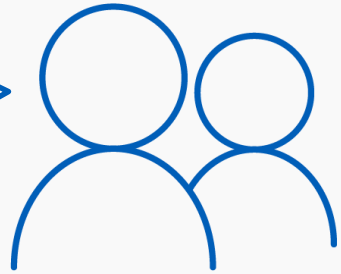
- In 2014-15 the annual cost of diabetic foot disease to the NHS in England was estimated at around £1 billion, in addition to the personal/social costs of reduced mobility and sickness absence.
- More than 64,000 people with diabetes in England and Wales[2] are thought to have foot ulcers at any given time.
- Only around three in five people with diabetes who have had a diabetic foot ulcer survive for five years.
- Treatment for diabetic foot disease may involve amputation. There are around 7,000 leg, foot or toe amputations in people with diabetes in England each year.
- Lower limb amputation is carried out more than 20 times as often in people with diabetes than it is in people without diabetes.
- Only around half of people who have lost a leg because of diabetes survive for two years.

Notes: **1.** Adapted from Kerr, M (2017). **2**. Incidence methodology taken from Kerr, M (2017) and adapted to include the Welsh diabetic population (population figures taken from the 2016 Quality Outcome Framework).

Introduction: Why is this report important?

"People living with diabetes must be able to be confident that, locally, there are foot care services that they can rely on. It is important for services to work effectively to prevent diabetic foot disease. People with diabetes also need to know that the best treatment is available at all stages of diabetic foot disease to ensure the best possible outcomes."

Corinne Wykes and Roy Johnson
Patient Representatives, NDFA



Findings and recommendations in this report support the audit questions:

1. Structures: Does treatment of active diabetic foot disease comply with national recommended guidelines?
2. Processes: Are the outcomes of diabetic foot disease optimised?
3. Outcomes: Are NICE recommended care structures in place for the management of diabetic foot disease?

Introduction: About this report

The NDFA has data on more than 22,000 episodes of diabetic foot ulceration in England and Wales – holding information on care structures, patient management and outcomes.

To produce the analysis for this report, NDFA patient data has been linked to:

- Core National Diabetes Audit (NDA) for **demographic** and **primary care** data;
- Hospital episode data to find **amputation**, **revascularisation** (restoration of blood circulation) and **foot disease admissions**.

Information is presented on:

- Care **structures**
- Ulcer **severity**
- **Time** to first expert assessment
- **Mental health** and **learning disabilities**
- **Outcomes** at 12 and 24 weeks
- Hospital **admissions**, including foot disease
- Hospital **procedures** (amputation/revascularisation)

Information is grouped by:

Main report: **National** (England and Wales)

Local reports:

- Sustainability and Transformation Plans (**STP**)
- Clinical Commissioning Groups (**CCG**)
- NHS **Trust**/Local Health Boards (**LHB**)
- Specialist foot care **services**

Key messages

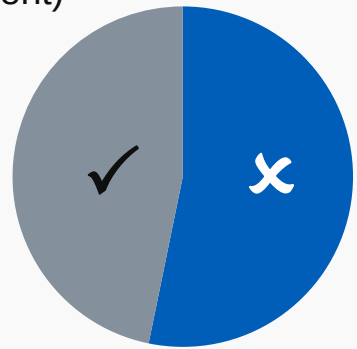
Findings and Recommendations

Key messages: Care structures

Since the first survey in 2015, the NDFA has found that the basic framework for effective prevention and management of diabetic foot disease often seems to be missing.

Are all 3 care structures confirmed?

No. Less than half of participating commissioners confirmed that all three care structures were in place (47 per cent)



Key recommendation

Commissioners should work with local providers to ensure **pathways** meet **NICE** guidelines

Are care structures associated with outcomes? - Yes

Referral for assessment pathway

Yes	No
21% seen within 2 days (*excl. self-referred*)	16% seen within 2 days (*excl. self-referred*)
43% severe ulcers	48% severe ulcers
50% healed at 12wks (of ulcer/amputation)	47% healed at 12wks (of ulcer/amputation)

Notes: Please see Glossary (Care structures) for further information.

Key messages: Processes and outcomes

Since starting in 2014, the NDFA has firmly established the relationships between time to first expert assessment and ulcer severity, healing outcomes and hospital admissions.

Time to first expert assessment

Short	Long
≤ 2 days	> 2 months
50% severe ulcer	56% severe ulcer
48% healed at 12 wks 67% healed at 24 wks	33% healed at 12 wks 54% healed at 24 wks

Key recommendation

Services should establish local pathways that **minimise** the **time** taken to be **seen** by a specialist foot care service

Ulcer severity

Less severe	More severe
40% hospital admission 11% for foot disease	61% hospital admission 33% for foot disease
4% amputation 4% revascularisation[1]	12% amputation 14% revascularisation[1]
60% healed at 12wks 74% healed at 24wks	34% healed at 12wks 56% healed at 24wks

Notes: **1**. revascularisation = restoration of blood circulation.

Key messages: Recommendations (1)

For people with diabetes

- If you experience loss of feeling (neuropathy), seek advice about how to prevent foot ulcers.
- If you have poor circulation (peripheral artery disease or ischaemia), seek advice about how to prevent foot ulcers.
- If you get a new foot ulcer, seek quick referral to a local specialist diabetes foot care service.

Resources at Diabetes UK will provide you with further information to help with managing your feet and who to contact if you have any of the above concerns.

Key messages: Resources for people with diabetes

For people with diabetes: The following resources will provide you with further information to help with managing your feet:

- Taking care of your feet: https://www.diabetes.org.uk/Guide-to-diabetes/Complications/Feet/Taking-care-of-your-feet/
- Tips for everyday foot care: https://www.diabetes.org.uk/Guide-to-diabetes/Complications/Feet/Taking-care-of-your-feet#Annual
- Diabetes and foot problems: https://www.diabetes.org.uk/Guide-to-diabetes/Complications/Feet/
- The 'Putting Feet First' campaign: https://www.diabetes.org.uk/get_involved/campaigning/putting-feet-first

Key messages: Recommendations (2)

For healthcare professionals

Including podiatrists, diabetes specialist nurses, diabetes consultants and any healthcare professional that works with people with diabetes.

- Use the audit findings to encourage commissioners and service managers to ensure a NICE-recommended diabetes foot care service is in place.
- Create simple and rapid referral pathways.
- Participate in the NDFA to collaborate in this nationwide drive to improve the outcomes for diabetic foot disease.

Key messages: Recommendations (3)

For commissioners

- Ensure your local services have an easily accessible diabetes specialist foot care team. The South East SCN has prepared commissioning guidance and sample service specification which may help in developing these services[1].
- Ensure that your local diabetes specialist foot care services participate in the NDFA to help improve the disabling, lethal and costly consequences of diabetic foot disease.
- Appoint a diabetes foot disease lead to work with local providers, to review services and local care pathways and to ensure pathways meet NICE guidelines. Commissioners should use the NDFA findings for their local area as a key part of their gap analysis to understand overall NICE compliance and resource utilisation across their commissioning footprint.

Notes: **1**. South East Coast Strategic Clinical Networks (2015)

NDFA Care Structures Survey

Results and Findings

NDFA Care Structures Survey: Overview

Audit questions: Are the following NICE-recommended care structures[1] in place for the management of diabetic foot disease?

1. Training for routine diabetic foot examinations[2]
2. An established Foot Protection Service pathway[3]
3. An established Foot Disease pathway for new referrals – if needed – for an assessment within 24 hours[4]

Why is this important?

The NICE guidance, supported by evidence from other studies, highlights the basic structures and pathways of care which are necessary to provide improved outcomes for people with diabetic foot ulcers.

Without this care infrastructure it is not possible to identify ulcer risk, minimise the onset of ulceration or treat diabetic foot disease efficiently and effectively.

Key findings

- Less than half of participating commissioners provide all three NICE-recommended care structures.

47 per cent of full responders[5]

- Pathways for rapid expert assessment are associated with shorter time to assessment and less severe ulcers.
- Pathways for rapid expert assessment are associated with better healing outcomes.

Notes: **1**, **2**, **3**, **4**, **5**. Please refer to list of footnotes in the footnote section. Please see Glossary (Care structures) for further information.

NDFA Care Structures Survey: Participation

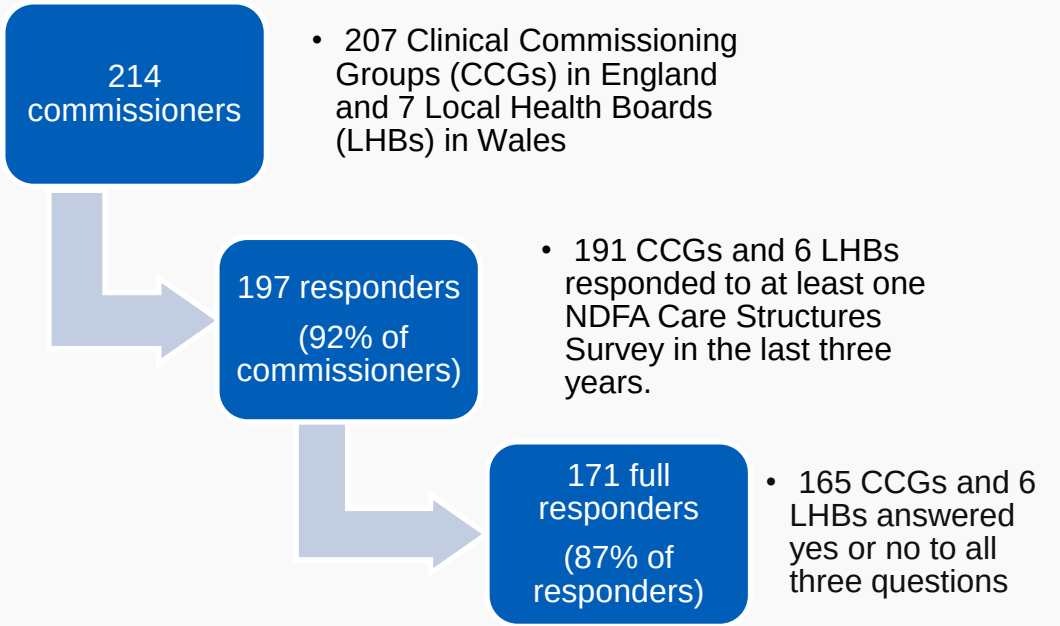
Methodology

To maximise the utility of the NDFA Care Structures Survey data, responses from the 2015, 2016 and 2017 surveys have been combined into one **composite table**, containing the commissioner's latest response to each question.

With this methodology, data for 92 per cent of the commissioners active during the 2017 collection period is obtainable. 75 per cent of commissioners responded to the 2017 survey; 54 per cent answered the survey in 2016 and 60 per cent in 2015.

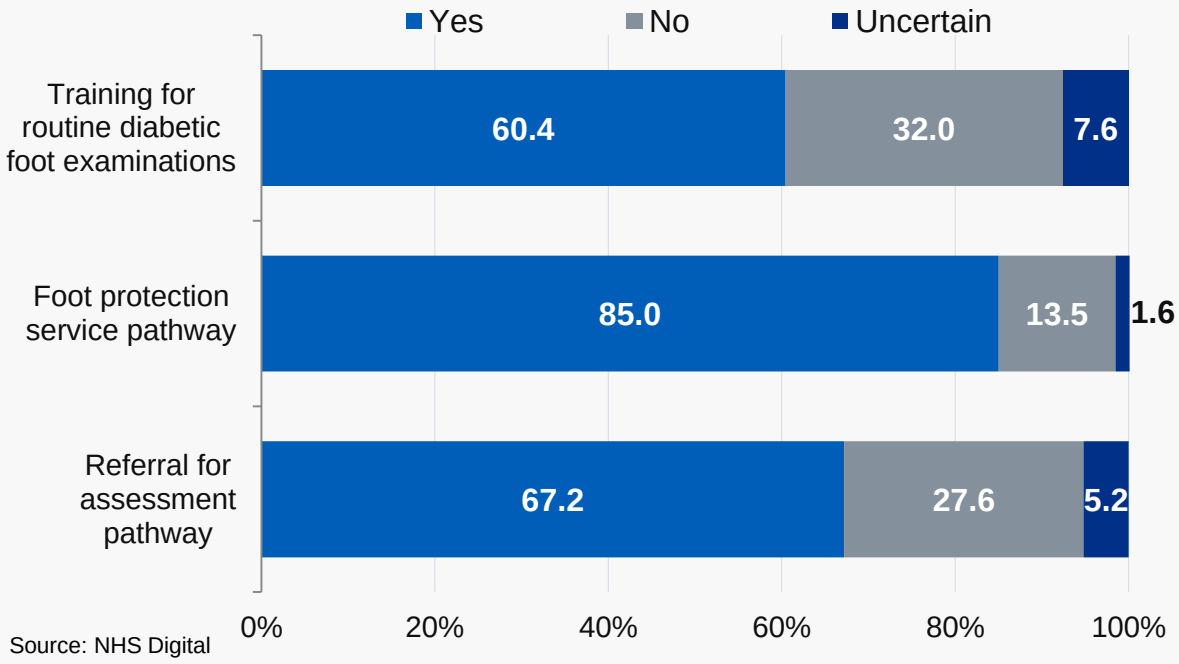
Commissioners are encouraged to submit to every NDFA Care Structures Survey, ensuring the survey data is as accurate and up-to-date as possible.

Composite responses (2015 to 2017)



NDFA Care Structures Survey: Details (1)

Figure 1: Provision of care structures for the management of diabetic foot disease,
Commissioners, England and Wales, 2017



Source: NHS Digital

Notes: Please see Glossary (Care structures) for further information.

1 in 3 responders do **not** provide diabetic foot examination **training**

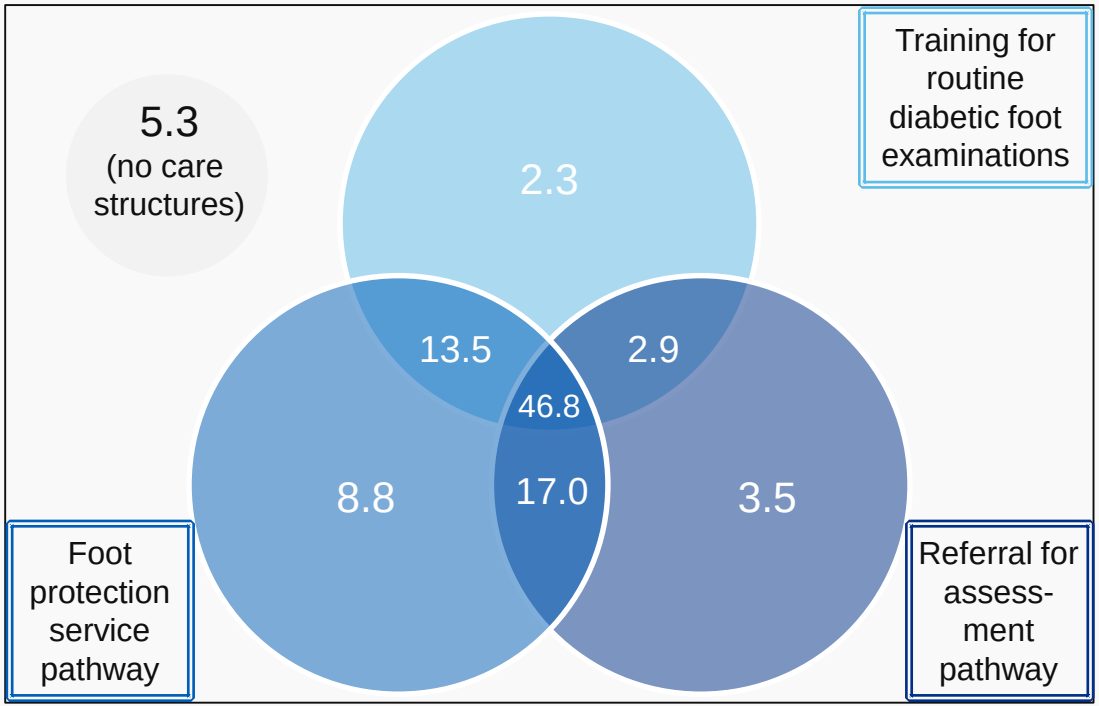
32 per cent of responders

1 in 8 responders were **uncertain** about which **care structures** they commission

13 per cent did not give definitive responses to all 3 questions

NDFA Care Structures Survey: Details (2)

Figure 2: Per cent of commissioners providing care structures for the management of diabetic foot disease, Commissioners, England and Wales, 2017



Less than **half** of participating commissioners **provide** all three **care structures**

47 per cent of full responders

Notes:
Only **full responders** are included in this analysis i.e. commissioners that responded "yes" or "no" to all three survey questions (87 per cent of all the organisations that responded to a NDFA Care Structures Survey).

Please see Glossary (Care structures) for further information.

NDFA Care Structures Survey: Associations

Table 1: Ulcer characteristics and outcomes, by provision of a referral for assessment pathway, England and Wales, 2014-2017

Ulcer characteristic	Referral for assessment pathway?		
	Yes	No	
Time to assessment			
Self-referred	30.6	23.0	*
≤ 2 days[1]	20.8	16.2	*
> 2 months[1]	11.7	13.0	n
Ulcer severity			
Less severe	56.8	51.9	*
Severe	43.2	48.1	*

Outcome	Referral for assessment pathway?		
	Yes	No	
12 week outcome[2]			
Alive and ulcer-free	50.4	46.9	*
Persistent ulceration	47.8	51.3	*
24 week outcome[2]			
Alive and ulcer-free	67.6	66.6	n
Persistent ulceration	26.3	27.6	n

***** = *statistically significant at the 0.05 level (Yes vs No).* **n** = *not statistically significant*

Provision of a referral for assessment **pathway** is associated with a **shorter** time to assessment**, less severe** ulcers, and **better** healing outcomes

Notes: **1**. Denominator excludes self-referrals. **2**. Denominator excludes ulcers with an unknown outcome.

NDFA Care Structures Survey: Commentary

For localities, outcomes of the management of foot disease are dependent on the provision of the core recommendation:

Availability of a designated expert foot care service for urgent assessment of new foot ulcers when necessary

Where this is not available, clinical outcome is worse. In 2014-2017, less than half of all those responsible for commissioning care services were able to affirm that all three care structures were in place for their community.

NDFA team

‘There has been an additional £10 million transformation fund investment by NHS England to establish MDFTs where they do not exist currently, and to expand multi-disciplinary foot care service capacity where additional capacity is required.’

NHS England

Recommendations

All those responsible for commissioning footcare services in England and Wales should ensure that:

- A system of training is available for all healthcare professionals undertaking routine foot screening in diabetes.
- A pathway is established so that all people with diabetes who are at increased risk of foot ulceration can – where needed – receive from a Foot Protection Service:
  - Further assessment
  - Surveillance
  - Protective care
- A clear pathway exists to ensure that people with new diabetic foot ulcers are referred – according to NICE guidance – within one working day for expert assessment.

Participation: NDFA processes and outcomes

Results and Findings

Participation: Overview

Cohort

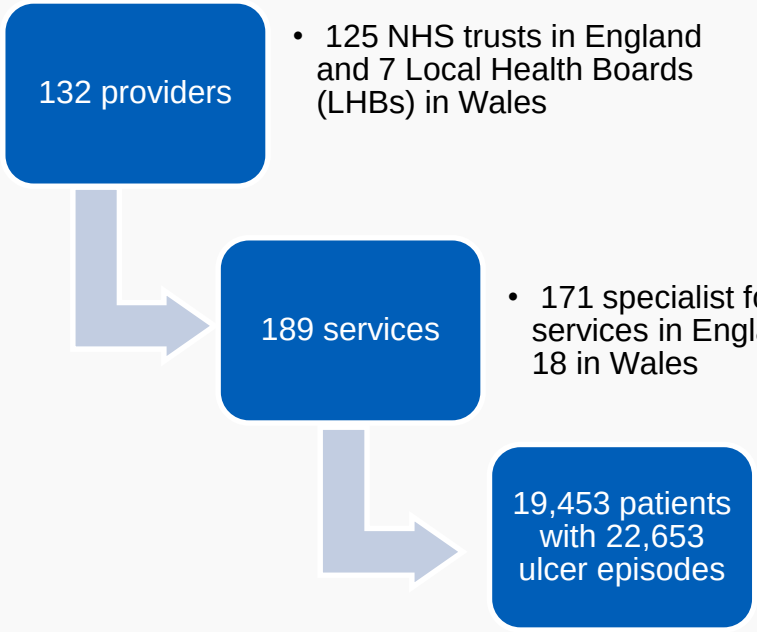
The NDFA Third Annual Report covers patients in England and Wales with ulcers that underwent first expert assessment by a specialist foot care service in the 32 months between 14 July 2014 and 31 March 2017.

Case ascertainment

Three methods of establishing case ascertainment have been attempted[1], and all suggest the NDFA includes between 10 and 20 per cent of incident ulcers. Probable low case ascertainment should therefore be considered when interpreting NDFA findings, with acknowledgement that:

- The patients submitted to the NDFA may not be representative of the entire population of people with diabetic foot ulcers.
- Counts in the NDFA are likely to underestimate the true national figures (e.g. number of bed days).

Participation: All audit data, 2014-2017



Notes: 1. Please refer to list of footnotes in the footnote section.
Please see Glossary (Healthcare providers) for explanation of terms.

Participation: Cumulative activity in 2014-2017

Table 2: Participation in the NDFA processes and outcomes collection, England and Wales, 2014-2017

Audit year	Providers	Services	Patients	Ulcer episodes
2014-15[2]	104	142	5,121	5,320
2015-16	112	156	7,373	7,949
2016-17	113	159	8,703	9,384
Total	**132**	**189**	**19,453**	**22,653**

Participated in …	Services	
	Number	Per cent
1 audit year	35	18.5
2 audit years	40	21.2
3 audit years	114	60.3

The number of **ulcers** submitted to NDFA has **increased** by **18 per cent**

Between 2015-16 and 2016-17

Less than **two thirds** of **services** have been involved in all **three years**

60 per cent have participated every year

Notes: **2**. Please refer to list of footnotes in the footnote section. Please see Glossary (Healthcare providers) for explanation of terms.

Participation: Mental illness and learning disability

Audit question: How many people with diabetic foot ulcers also have a serious mental illness or learning disability?

How is this measured? The National Diabetes Audit collects data on whether a person has a learning disability[3] (since 2015-16) and/or serious mental illness (since 2016-17). NDFA patients are linked to find how prevalent these conditions are amongst people with diabetic foot ulcers.

Why is this important? Patients with these conditions may need additional help in order to best manage their care. Knowing the prevalence of these conditions can help foot care services plan how to support their patients.

Key findings

- 1.9 per cent of NDFA patients have a serious mental illness.
- 0.8 per cent of NDFA patients have a learning disability.
- Learning disability is no more prevalent in NDFA patients than in the general diabetic population.

The number of NDFA patients with learning disability or serious mental illness recorded is so low conclusions cannot be made about the outcomes for these patients in comparison to others.

Notes: **3**. Please refer to list of footnotes in the footnote section.

Time to first expert assessment

Results and Findings

Time to first expert assessment: Overview

Audit question: Does the length of time to first expert assessment affect ulcer severity at presentation?

How is this measured? For each ulcer, the interval from initial presentation to a health professional to first assessment by a specialist who assumes care of the foot is recorded. Ulcer severity at first expert assessment is recorded using the SINBAD scoring system, where an ulcer is scored between 0 (least severe) and 6 (most severe). An ulcer with a SINBAD score of 3 or above is classed as a severe ulcer.

Why is this important? A relationship between longer times to first expert assessment and severe ulceration emphasises the importance of ensuring that prompt referral for specialist assessment is made – a linchpin of the NICE guidance[1].

Key findings

- When the time to first expert assessment is **>2 months**, an ulcer is more likely to be **severe**.

  56 per cent vs. 35 to 50 per cent for shorter time intervals and self referred ulcers.

- **Self-referred** ulcers are less likely to be **severe**.

  35 per cent vs. 48 to 56 per cent for other categories

Recommendation

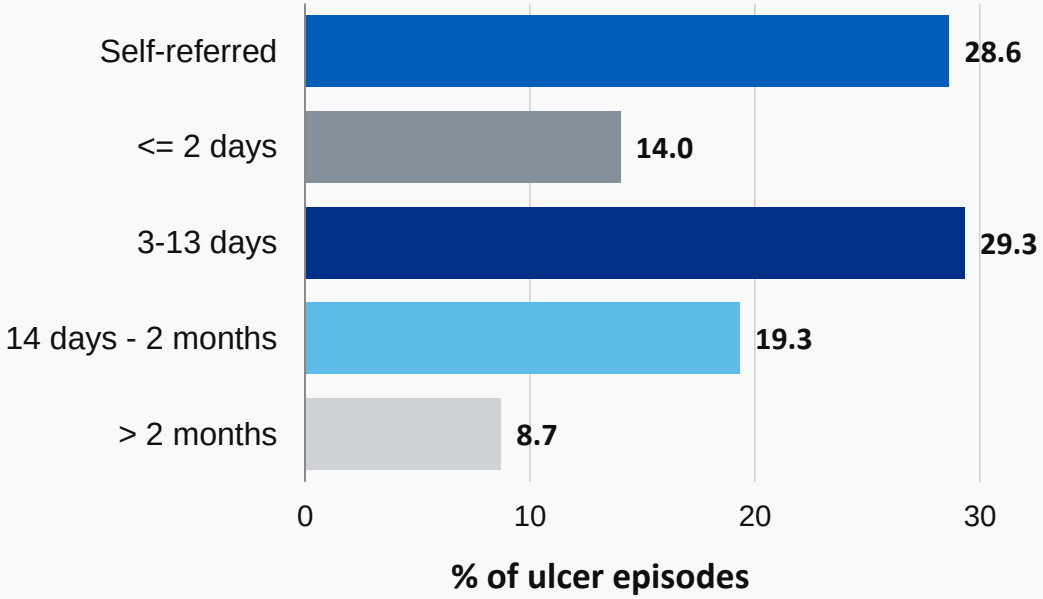
Every person with a foot ulcer should be referred for expert assessment along a clear care pathway that meets NICE guidance.

NICE guidance: People with diabetes who have an active foot problem should be referred to a specialist team within one working day for triage within one further working day[1].

Notes: **1**. Please refer to list of footnotes in the footnote section. Please see Glossary (Patient pathway/Referrals) for explanation of terms.

Time to first expert assessment: Summary

Figure 3: Time to first expert assessment,
England and Wales, 2014-2017



Almost **two fifths** of ulcers had a **time** to first assessment of **two or more weeks**

39 per cent, excluding self-referrers.

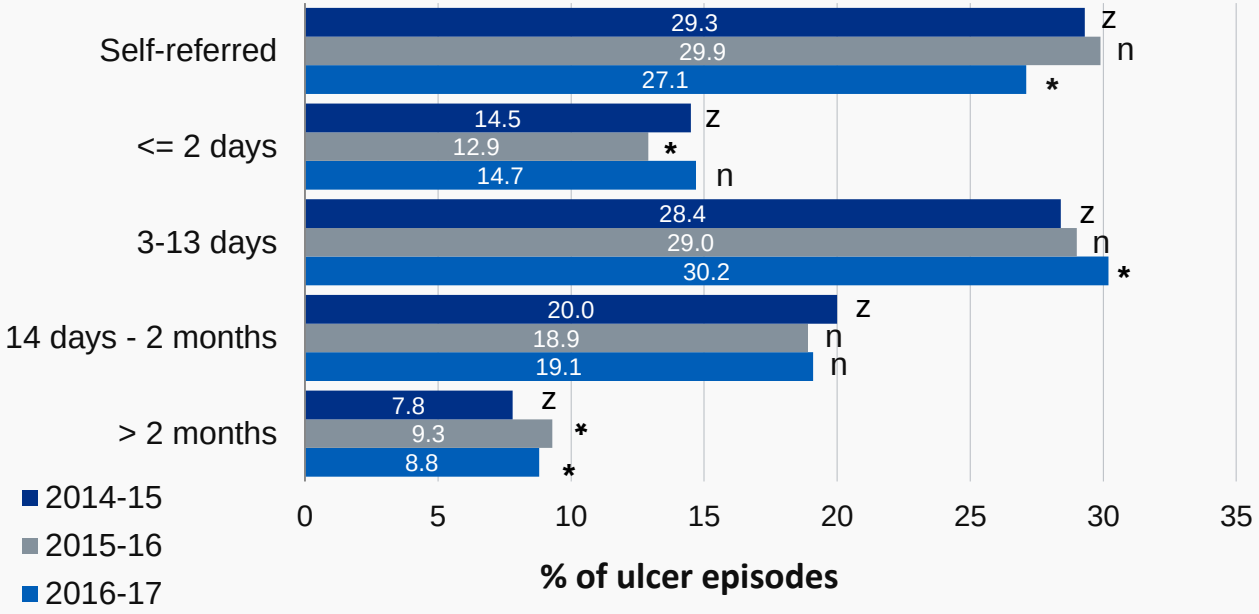
Almost **one third** of ulcers were **self-referred**

29 per cent.

Notes: Please see Glossary (Patient pathway/Referrals) for explanation of terms.

Time to first expert assessment: vs. audit year

Figure 4: Time to first expert assessment, by audit year, England and Wales, 2014-2017



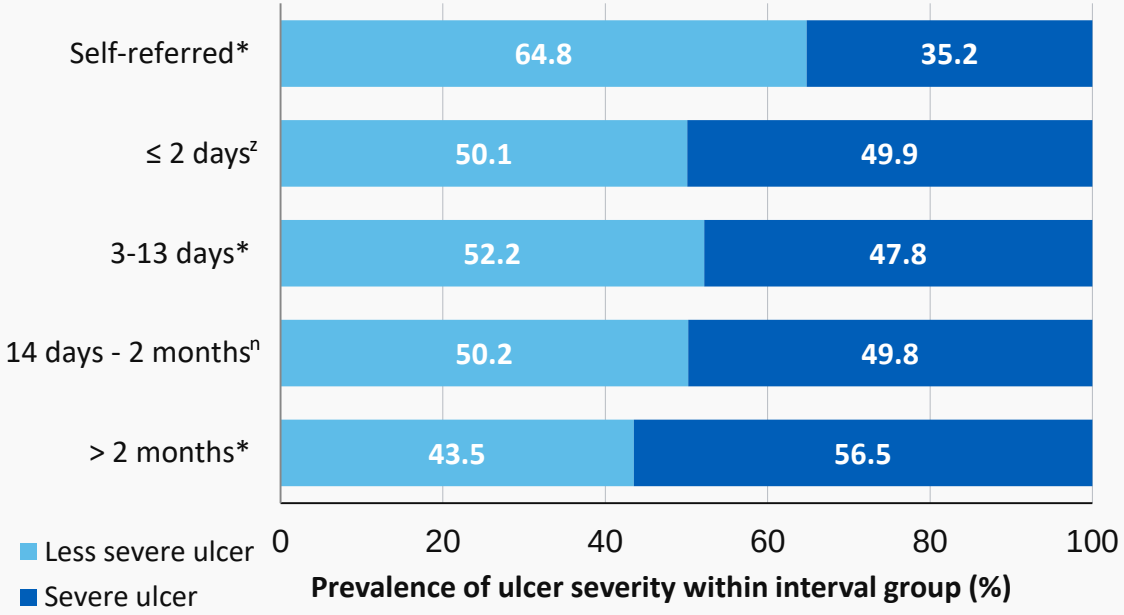
7.8 per cent
vs
8.8 per cent

More ulcers in **2016-17** had a time to expert assessment of **>2 months** than those seen in **2014-15**

Notes: ***** = statistically significant at the 0.05 level (vs 2014-15).
n = not statistically significant (vs 2014-15). **z** = not applicable. Used as comparison group.
See Glossary (Patient pathway/Referrals) for explanation of terms.

Time to first expert assessment: vs. ulcer severity

Figure 5: Time to first expert assessment, by ulcer severity, England and Wales, 2014-2017



Notes: * = statistically significant at the 0.05 level (vs ≤2 days).
n = not statistically significant (vs ≤2 days). **z** = not applicable. Used as comparison group.
See Glossary (Patient pathway/Ulcer characteristics/Referrals) for explanation of terms.

Ulcers seen with time to expert assessment **>2 months** are **most likely** to be **severe**

56 per cent vs. 35 to 50 per cent

There is **little difference** in the proportion of **severe** ulcers in the **≤ 2 month** groups

Between 47.8 and 49.9 per cent, excluding self-referrers

Time to first expert assessment: Commentary

The evidence derived from over 20,000 new diabetic foot ulcers suggests that early referral is associated with ulcers of lesser severity, and lesser severity is associated with better outcomes.

NDFA team

Recommendation

All people with diabetic foot ulcers should be referred promptly for early specialist assessment, in line with NICE guidance.

Outcomes: Alive and ulcer-free

Results and Findings

Alive and ulcer-free: Overview

Audit questions:

What proportion of people were alive and ulcer-free at 12 and 24 weeks after the first expert assessment by the specialist foot care team?

How do 12 and 24 week outcomes relate to:

- Ulcer severity
- Time to first expert assessment

How is this assessed?

At 12 and 24 weeks specialist foot care services record whether the patient is alive and, if so, whether they are free from active foot disease (i.e. the presenting ulcer has healed and there are no new unhealed ulcers).

Being 'ulcer-free' includes those patients who have had surgery (including major and minor amputation), provided all wounds have healed. Patients with an unknown outcome may include some patients who were lost to follow-up[1].

Key findings

- People are alive and ulcer-free at **24 weeks** in only two thirds of cases of a diabetic foot ulcer.
- **Severe** ulcers take longer to heal.
- Outcomes are worse if the time to first expert assessment is **≥14 days**.
- Outcomes for **self-referred** ulcers are better at 12 weeks, but are no different at 24 weeks.

Notes: **1**. Please refer to list of footnotes in the footnote section, and see Glossary (Referrals) for explanation of terms.

Alive and ulcer-free at 12 weeks: vs. ulcer severity

Table 3: Alive and ulcer-free[2] at 12 weeks by ulcer severity, England and Wales, 2014-2017

12 week outcome	All ulcers (22,653 episodes)		Less severe ulcer (12,320 episodes)			Severe ulcer (10,333 episodes)		
	Number	Per cent known[4]	Number	Per cent known[4]		Number	Per cent known[4]	
Alive and ulcer-free[2]	9,967	48.2	6,715	59.9	*	3,252	34.3	*
Persistent ulceration	10,211	49.3	4,290	38.3	*	5,921	62.4	*
Deceased[3]	520	2.5	201	1.8	*	319	3.4	*
Lost to follow up[1,4]	740	-	471	-	z	269	-	z
Unknown[4]	1,215	-	643	-	z	572	-	z

* = statistically significant at the 0.05 level (Less severe vs Severe).
n = not statistically significant (Less severe vs Severe). z = not applicable. Not used in cohort.
Alive and ulcer-free includes patients who have had an amputation provided all wounds have healed.

Less than **half** of ulcers are **healed** at **12 weeks**

48 per cent where outcome known

Severe ulcers are **less likely** to be **healed** at **12 weeks**

34 vs. 60 per cent where outcome known

Notes: **1**, **2**, **3**, **4**. Please refer to list of footnotes in the footnote section.
Please see Glossary (Patient pathway/Ulcer characteristics) for explanation of terms.

Alive and ulcer-free at 24 weeks: vs. ulcer severity

Table 4: Alive and ulcer-free[2] at 24 weeks by ulcer severity, England and Wales, 2014-2017

24 week outcome	All ulcers (21,082 episodes)		Less severe ulcer (11,469 episodes)			Severe ulcer (9,613 episodes)		
	Number	Per cent known[4]	Number	Per cent known[4]		Number	Per cent known[4]	
Alive and ulcer-free[2]	12,203	65.5	7,531	73.7	*	4,672	55.5	*
Persistent ulceration	5,081	27.3	2,002	19.6	*	3,079	36.6	*
New ulceration after being ulcer-free[5]	537	2.9	368	3.6	*	169	2.0	*
Deceased[3]	809	4.3	312	3.1	*	497	5.9	*
Lost to follow up[1,4]	821	-	460	-	z	361	-	z
Unknown[4]	1,631	-	796	-	z	835	-	z

* = statistically significant at the 0.05 level (Less severe vs Severe).
n = not statistically significant (Less severe vs Severe). z = not applicable. Not used in cohort.
Alive and ulcer-free includes patients who have had an amputation provided all wounds have healed.

Notes: **1**, **2**, **3**, **4**, **5**. Please refer to list of footnotes in the footnote section.
Please see Glossary (Patient pathway/Ulcer characteristics) for explanation of terms.

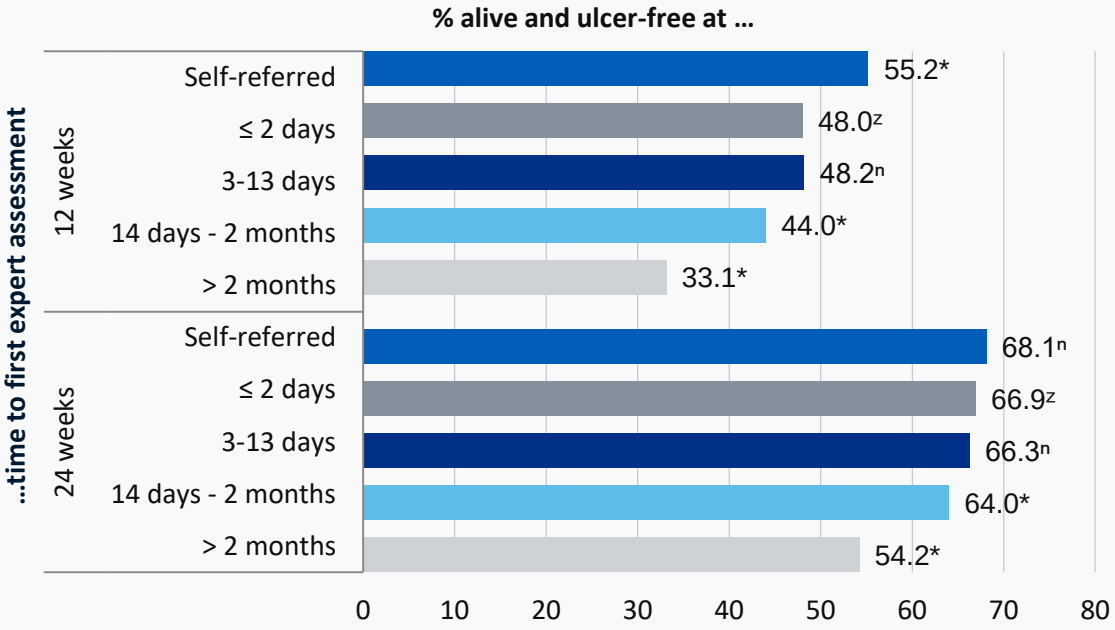
Only **two thirds** of ulcers are **healed** at **24 weeks**

Severe ulcers are **less likely** to be healed at **24 weeks**

More than **one in 25** ulcers are followed by **death** within **24 weeks**

Alive and ulcer-free: vs. time to expert assessment

Figure 6: Alive and ulcer-free[2] by time to first expert assessment, England and Wales, 2014-2017



Time to assessment of **14+ days** result in **worse** outcomes at 12 and 24 weeks

Compared to less than 14 days

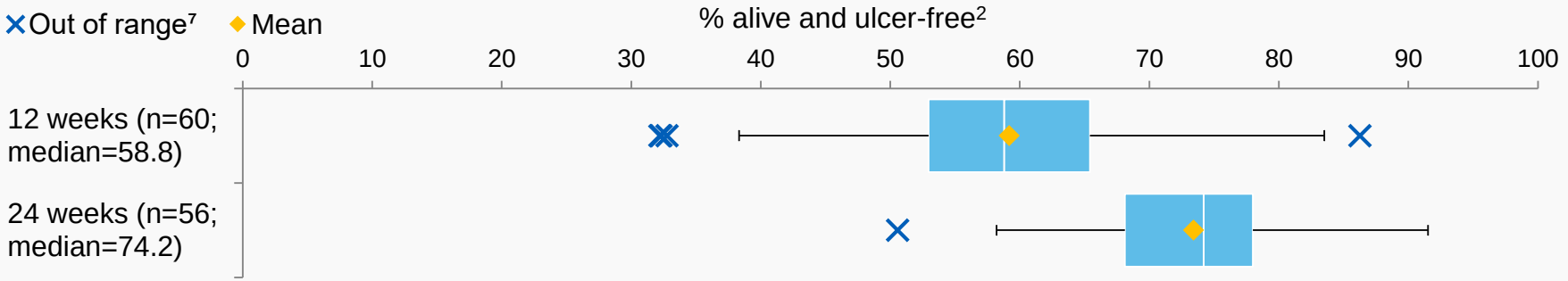
Self-referred ulcers are **more likely** to be healed at **12 weeks**

But no difference at 24 weeks (vs. less than 14 days)

Notes: ***** = statistically significant at the 0.05 level (vs ≤2 days).
n = not statistically significant (vs ≤2 days). **z** = not applicable. Used as comparison group.
2. Please refer to list of footnotes in the footnote section. Please see Glossary (Patient pathway/Referrals) for explanation of terms.

Alive and ulcer-free: Provider variation - less severe

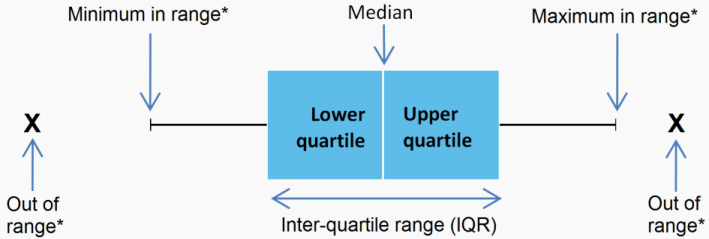
Figure 7: Observed outcome rates for <u>less severe</u> ulcers by NHS Trust and Local Health Board[6], England and Wales, 2014-2017



The observed rates of being **alive and ulcer-free** for **less severe** ulcers vary by over **40 percentage points** across care providers

…at 12/24 weeks with 50+ less severe ulcers

Box and whisker plots show the range of 'alive and ulcer-free' rates across care providers.

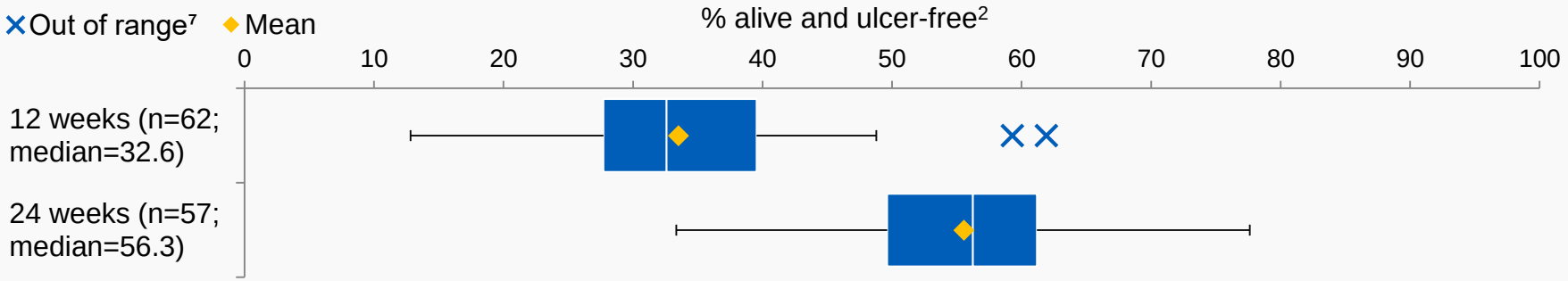


* Range = Between 1.5 x IQR below the lower quartile and 1.5 x IQR above the upper quartile.

Notes: **2**, **6**. **7**. Please refer to list of footnotes in the footnote section.
See Glossary (Healthcare providers/Patient pathway/Ulcer characteristics/ Statistical terms) for explanation of terms.

Alive and ulcer-free: Provider variation - severe

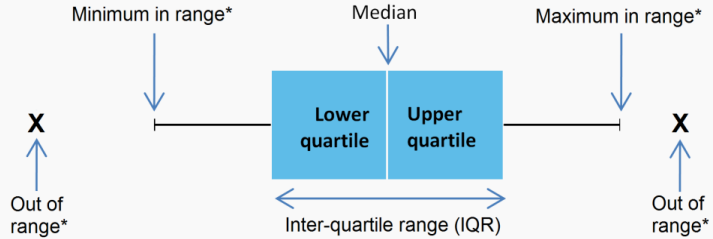
Figure 8: Observed outcome rates for <u>severe</u> ulcers by NHS Trust and Local Health Board[6], England and Wales, 2014-2017



The observed rates of being **alive and ulcer-free** for **severe** ulcers vary by over **40 percentage points** across care providers

…at 12/24 weeks with 50+ severe ulcers

Box and whisker plots show the range of 'alive and ulcer-free' rates across care providers.



* Range = Between 1.5 x IQR below the lower quartile and 1.5 x IQR above the upper quartile.

Notes: **2**, **6**, **7**. Please refer to list of footnotes in the <u>footnote</u> section.
See Glossary (<u>Healthcare providers</u>/<u>Patient pathway</u>/<u>Ulcer characteristics</u>/<u>Statistical terms</u>) for explanation of terms.

Alive and ulcer-free: Commentary

The rate at which people are found to be alive and ulcer-free has remained consistent over the course of the audit, and the audit findings concur with earlier associations found between time to assessment, ulcer severity and patient outcomes.

However, the NDFA has found that there continues to be a very wide variation in outcome rates across England and Wales. Healing rates at some providers are much lower, and although some of this variation may be due to differences in the population served by each provider, much appears to be related to other factors. Investigating these service level factors will be an important part of driving a higher rate of ulcer healing.

NDFA team

Recommendations

- All people with diabetic foot ulcers should be referred promptly for early specialist assessment, according to NICE guidance.
- Providers should endeavour to record all new instances of diabetic foot ulcers, and to complete outcome data for all patients registered in the audit, in order to ensure a more complete picture of patient outcomes.
- All audit participants should engage with audit-driven quality improvement work starting next year.

Outcomes: Factors associated with being alive and ulcer-free

Results and Findings

Factors associated with being alive and ulcer-free: Overview

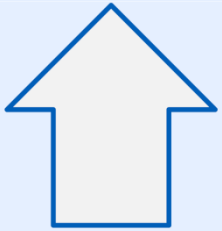
Audit question: What characteristics are associated with patients that are alive and ulcer-free at 12 and 24 weeks?

How is this measured? NDFA and NDA data is combined in a logistic regression model that looks for factors that are associated with patients who have a (12 or 24 week) outcome as alive and ulcer-free.

Why is this important? A strong model would suggest that patient and ulcer characteristics account for much of the variation in healing rates across different providers, and would enable robust adjusted healing rates to be produced at provider-level. However, if a strong model cannot be produced, then it suggests that differences in patient outcomes do not arise from differences in the demographics of the population or the ulcer characteristics at first expert assessment.

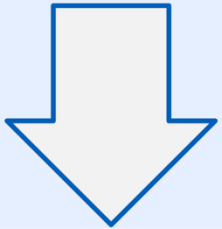
Notes: See Glossary (Statistical terms) for explanation of terms.

Key findings



Main associations with being alive and ulcer-free are:

- Having a single foot ulcer
- People of Asian ethnicity



Main associations with <u>not</u> being alive and ulcer-free are:

- Ischaemia (poor circulation), ulcer size and depth, neuropathy (loss of feeling)
- Time to first assessment of >2 months
- Charcot foot disease

Limitations

The overall power of both healing models is **poor** (c-statistics <0.7), with much of the variation in outcome not explained by factors included in the model.

Factors associated with being alive and ulcer-free at 12 weeks: Findings

WARNING!
The predictive power of the statistical model is **poor** (c-statistic <0.7).

Patient factors

▲*Asian* ▲Diabetic = 5-9yrs ▲*BMI 35-40 (Obese)* ▲*Diabetic = 0-4yrs* ▲*Ethnicity = Unknown* ▲Female

▼Current smoker
▼Smoking = Unknown
▼Ethnicity = Not stated

Healed?

✓ More likely

Less likely ✗

Ulcer factors

▲Single ulcer

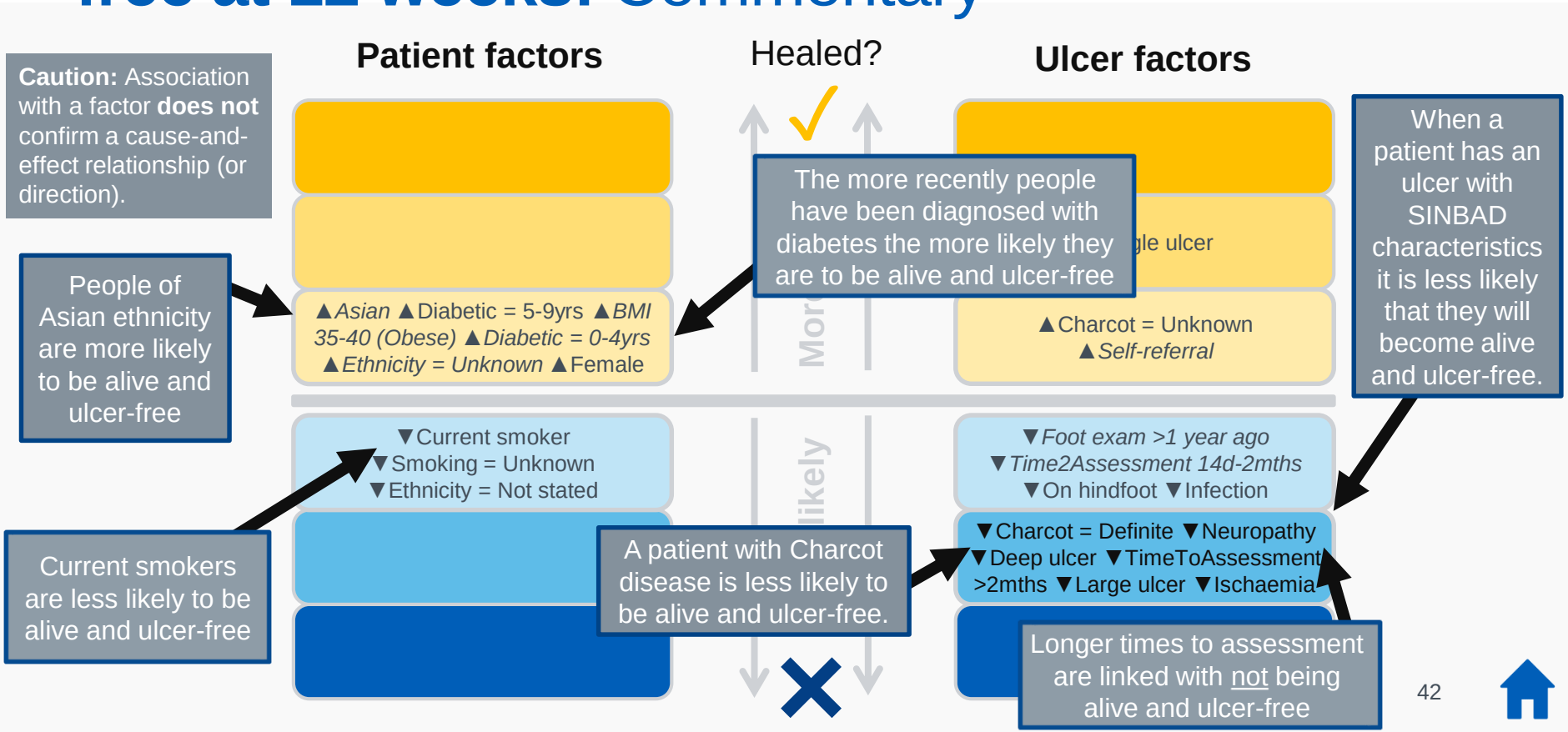
▲Charcot = Unknown
▲*Self-referral*

▼*Foot exam >1 year ago*
▼*Time2Assessment 14d-2mths*
▼*On hindfoot* ▼*Infection*

▼Charcot = Definite ▼Neuropathy ▼Deep ulcer ▼TimeToAssessment >2mths ▼Large ulcer ▼Ischaemia

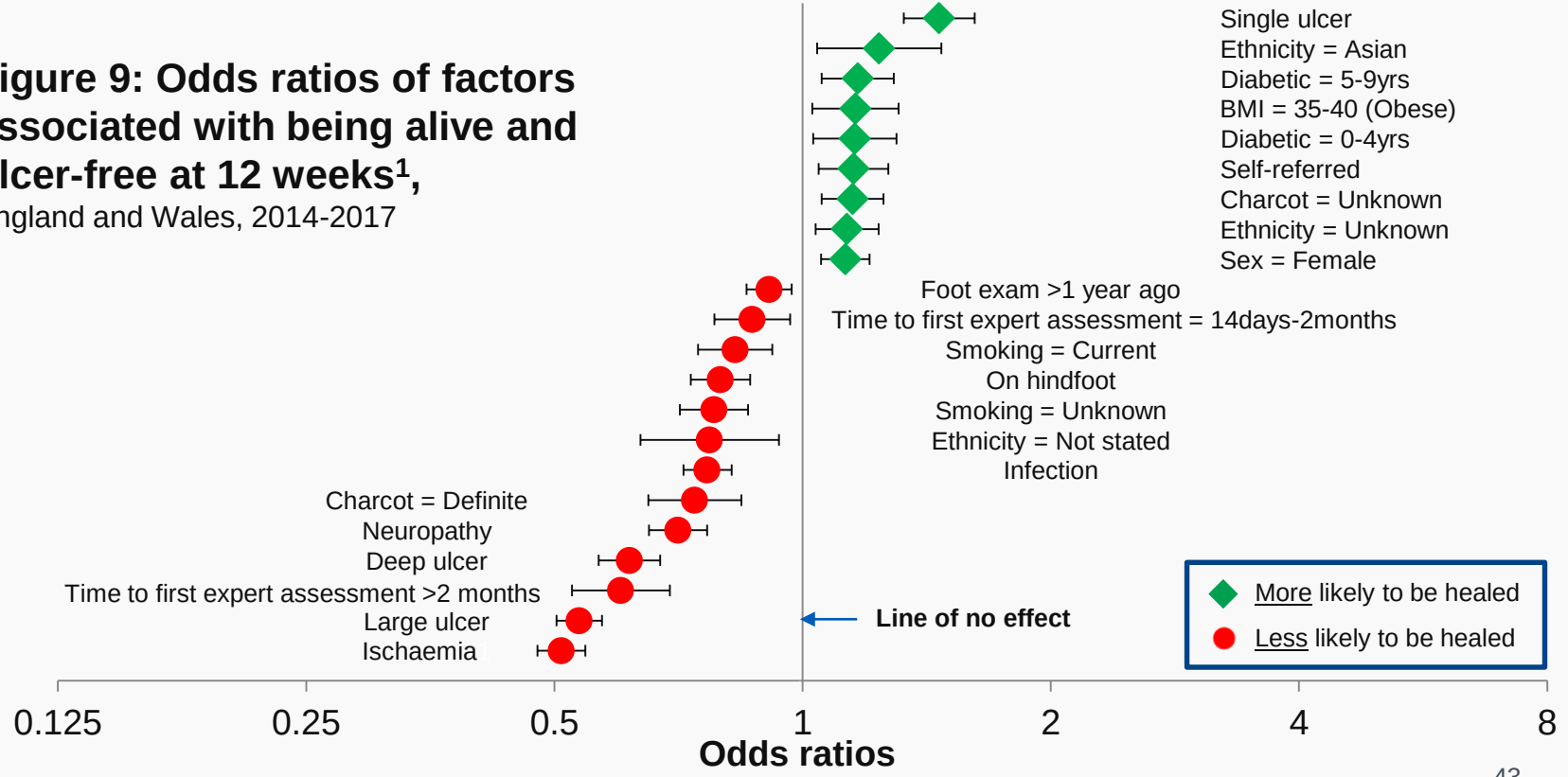
Notes: Italics = confidence interval close to line of no effect (1.0). See Glossary (Statistical terms) for explanation of terms.

Factors associated with being alive and ulcer-free at 12 weeks: Commentary



Factors associated with being alive and ulcer-free at 12 weeks: Details

Figure 9: Odds ratios of factors associated with being alive and ulcer-free at 12 weeks[1],
England and Wales, 2014-2017



Notes:
1. See Glossary (Statistical terms) for explanation of terms.

Factors associated with being alive and ulcer-free at 12 weeks: Characteristics tested

Patient characteristics: Association with outcome		
Age at assessment		☒
Body Mass Index	☑	
Care processes		☒
Deprivation quintile		☒
Diabetes duration	☑	
Diabetes type		☒
Ethnicity	☑	
Foot surveillance	☑	
Sex	☑	
Treatment targets		☒
Smoking status	☑	

Ulcer characteristics: Association with outcome		
Charcot disease	☑	
First ulcer in the audit		☒
Number of ulcers	☑	
Time to assessment	☑	
Ulcer area	☑	
Ulcer depth	☑	
Ulcer infection	☑	
Ulcer ischaemia	☑	
Ulcer neuropathy	☑	
Ulcer site (hindfoot)	☑	
Ulcer severity		☒

Being alive and **ulcer-free** at **12 weeks** is associated with **many** different factors

6 patient factors and 9 ulcer factors

There is **no link** between someone meeting their **treatment targets** for blood pressure, **cholesterol**, and **HbA1$_c$** and being alive and ulcer-free

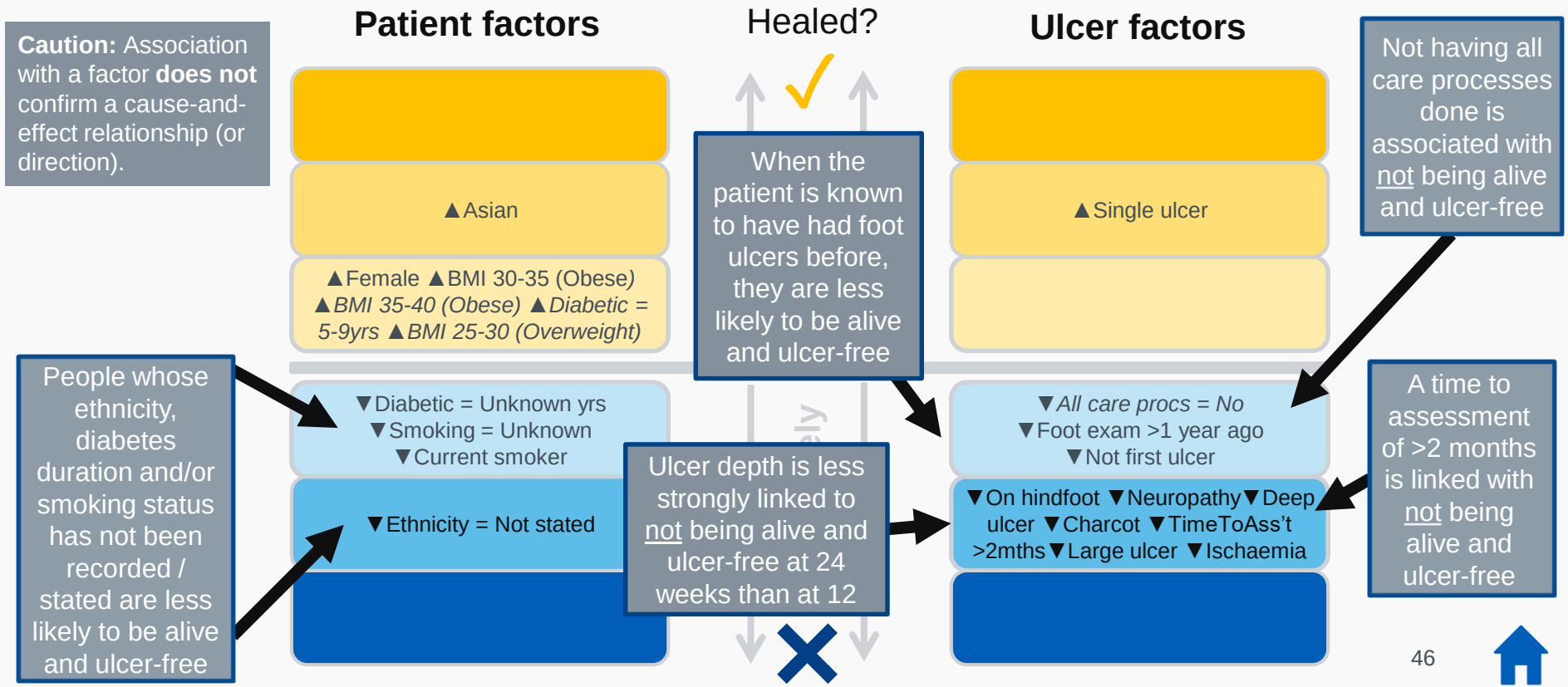
Factors associated with being alive and ulcer-free at 24 weeks: Findings

WARNING!
The predictive power of the statistical model is **poor** (c-statistic <0.7)

Patient factors	Healed?	Ulcer factors
	✓	
▲Asian	More likely	▲Single ulcer
▲Female ▲BMI 30-35 (Obese) *▲BMI 35-40 (Obese) ▲Diabetic = 5-9yrs ▲BMI 25-30 (Overweight)*		
▼Diabetic = Unknown yrs ▼Smoking = Unknown ▼Current smoker	Less likely	*▼All care procs = No* ▼Foot exam >1 year ago ▼Not first ulcer
▼Ethnicity = Not stated		▼On hindfoot ▼Neuropathy ▼Deep ulcer ▼Charcot ▼TimeToAss't >2mths ▼Large ulcer ▼Ischaemia
	✗	

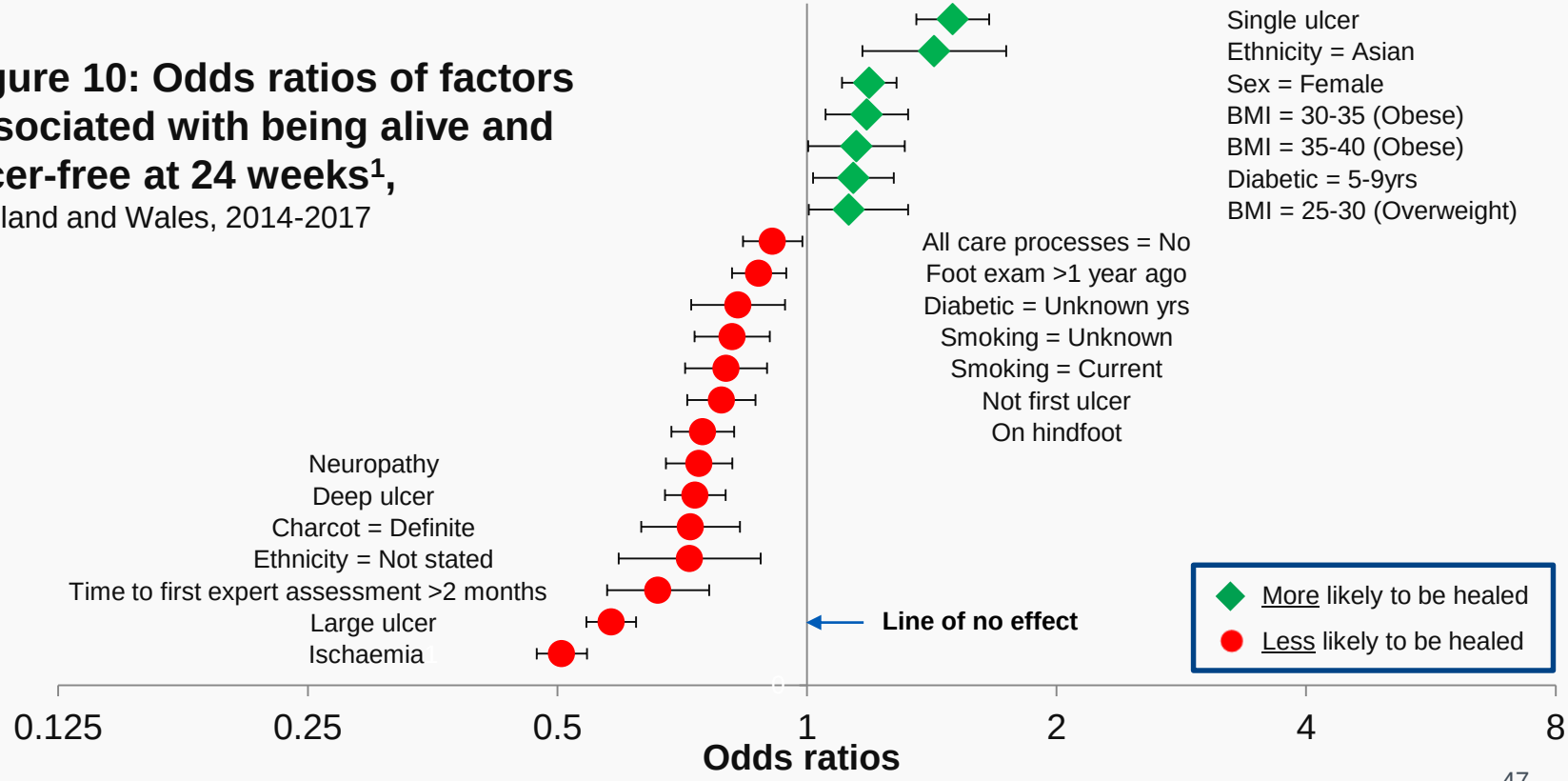
Notes: Italics = confidence interval close to line of no effect (1.0). See Glossary (Statistical terms) for explanation of terms.

Factors associated with being alive and ulcer-free at 24 weeks: Commentary



Factors associated with being alive and ulcer-free at 24 weeks: Details

Figure 10: Odds ratios of factors associated with being alive and ulcer-free at 24 weeks[1],
England and Wales, 2014-2017



Notes:
1. See Glossary (Statistical terms) for explanation of terms.

Factors associated with being alive and ulcer-free at 24 weeks: Characteristics tested

Patient characteristics: Association with outcome		
Age at assessment		☒
Body Mass Index	☑	
Care processes	☑	
Deprivation quintile		☒
Diabetes duration	☑	
Diabetes type		☒
Ethnicity	☑	
Foot surveillance	☑	
Sex	☑	
Treatment targets		☒
Smoking status	☑	

Ulcer characteristics: Association with outcome		
Charcot disease	☑	
First ulcer in the audit	☑	
Number of ulcers	☑	
Time to assessment	☑	
Ulcer area	☑	
Ulcer depth	☑	
Ulcer infection		☒
Ulcer ischaemia	☑	
Ulcer neuropathy	☑	
Ulcer site (hindfoot)	☑	
Ulcer severity		☒

Infection of the ulcer is **not** associated with being alive and **ulcer-free** at 24 weeks

Ulcer infection is associated with outcomes at 12 weeks.

There is **no link** between someone meeting their **treatment targets** for blood pressure **cholesterol, and HBA1$_C$** and being alive and ulcer-free

Factors associated with being alive and ulcer-free: Commentary

A large number of factors are weakly associated with being alive and ulcer-free at 12 weeks or 24 weeks. However, even with the large number of new ulcers now recorded in NDFA, no dominant factors have emerged and most of the substantial variation across England and Wales remains unexplained.

It is, however, interesting to note that there is no evidence of any association between outcome at 12 or 24 weeks and age, social deprivation or diabetes type.

NDFA team

Recommendation

Expert diabetes foot treatment services could use the differences identified by NDFA to explore collaboratively which aspects of their care programmes might influence time to healing.

Outcomes: Hospital admissions

Results and Findings

Hospital admissions: Overview

Audit questions: What proportion of people with a new foot ulcer have a hospital admission in the 6 months following first expert assessment? How many of their admissions are known to be related to foot disease?

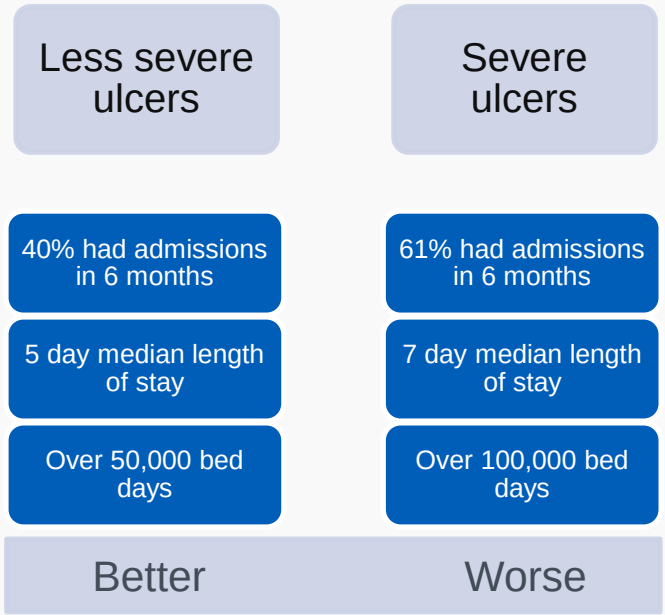
Common reasons for hospital admission in people with diabetic foot disease include:

- Infection of the diabetic foot ulcer requiring antibiotics, wound debridement (removal of dead/infected tissue) and amputation
- Cardiovascular disease (heart attack, heart failure, stroke, compromised lower limb blood supply)

Why is this important?

- Management of diabetic foot disease should as far as possible be an outpatient activity, not requiring a hospital stay.
- Hospital admission for diabetic foot disease is costly to the NHS and can be distressing for those directly affected.

Findings



Notes: Please see Glossary (Foot disease-related admission/Ulcer characteristics/Which admissions are included?) for explanation of terms.

Hospital admissions: Ulcer severity

Table 5: Hospital admissions within 6 months of first expert assessment[1], by ulcer severity, NDFA patients, England and Wales, 2014-2017

Admissions	All ulcers (17,514 patients)		Less severe ulcer (9,401 patients)			Severe ulcer (8,113 patients)		
	Number	Per cent	Number	Per cent		Number	Per cent	
Any admission?[2]								
Not admitted	8,825	50.4	5,622	59.8	*	3,203	39.5	*
One or more admission	8,689	49.6	3,779	40.2	*	4,910	60.5	*
Foot disease admission?[3]								
Not admitted	13,791	78.7	8,358	88.9	*	5,433	67.0	*
One or more admission	3,723	21.3	1,043	11.1	*	2,680	33.0	*

***** = *statistically significant at the 0.05 level (Less severe vs Severe).* **n** = *not statistically significant*

Notes: **1**, **2**, **3**. Please refer to list of footnotes in the footnote section.
Please see Glossary (Foot disease-related admission/Ulcer characteristics/Which admissions are included?) for explanation of terms.

Half of people with diabetic foot ulcers are **admitted** to hospital within **6 months**

People with **severe** ulcers are **1.5** times as likely to be admitted to hospital and **three** times as likely to be admitted for **foot disease**

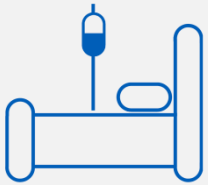
33 vs. 11 per cent
and 61 vs. 40 per cent

Hospital admissions: Bed days

Table 6: All hospital admissions within 6 months of first expert assessment[1]: bed days[4], by ulcer severity, NDFA patients, England and Wales, 2014-2017

Ulcer severity	Number of patients	Number of hospital admissions	Number of bed days[4, 6]	Length of stay[5]	
				Median	Mean
Any admission?[2]					
Less severe	9,401	7,612	54,820	5.0	11.0
Severe	8,113	11,242	108,651	7.0	13.3
All ulcers	**17,514**	**18,854**	**163,471**	**6.0**	**12.4**
Foot disease admission?[3]					
Less severe	9,401	1,549	17,017	8.0	13.5
Severe	8,113	4,432	60,830	10.0	16.9
All ulcers	**17,514**	**5,981**	**77,847**	**10.0**	**16.0**

Notes: **1**, **2**, **3**, **4**, **5**, **6**. Please refer to list of footnotes in the footnote section.
Please see Glossary (Foot disease-related admission/Ulcer characteristics/Which admissions are included?/Length of stay and bed days) for explanation of terms.



NDFA patients were in hospital for **160,000 bed days** within 6 months[6]

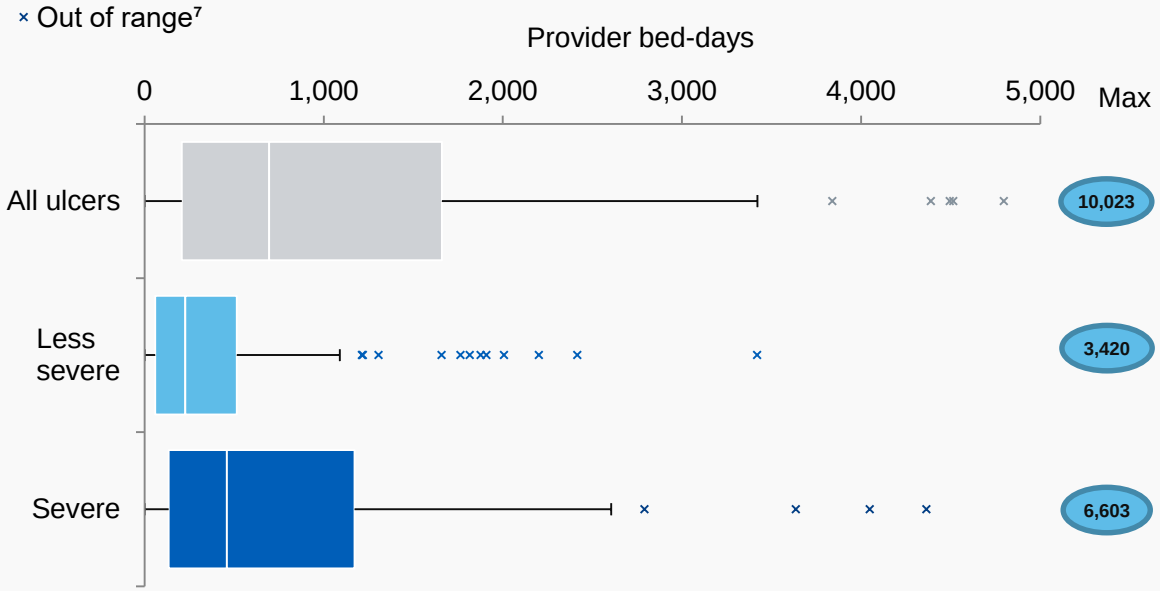
People with severe ulcers make up 66 per cent of all NDFA bed days and 78 per cent of bed days for foot disease admissions

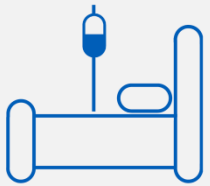
People with **severe** ulcers are admitted to hospital for **longer**

A median stay of 7 vs 5 days (any admission)

Hospital admissions: Bed days, by provider

Figure 11: Hospital admissions[2] within 6 months of first expert assessment[1]: bed-days[4,6], by provider, by ulcer severity, NDFA patients, England and Wales, 2014-2017





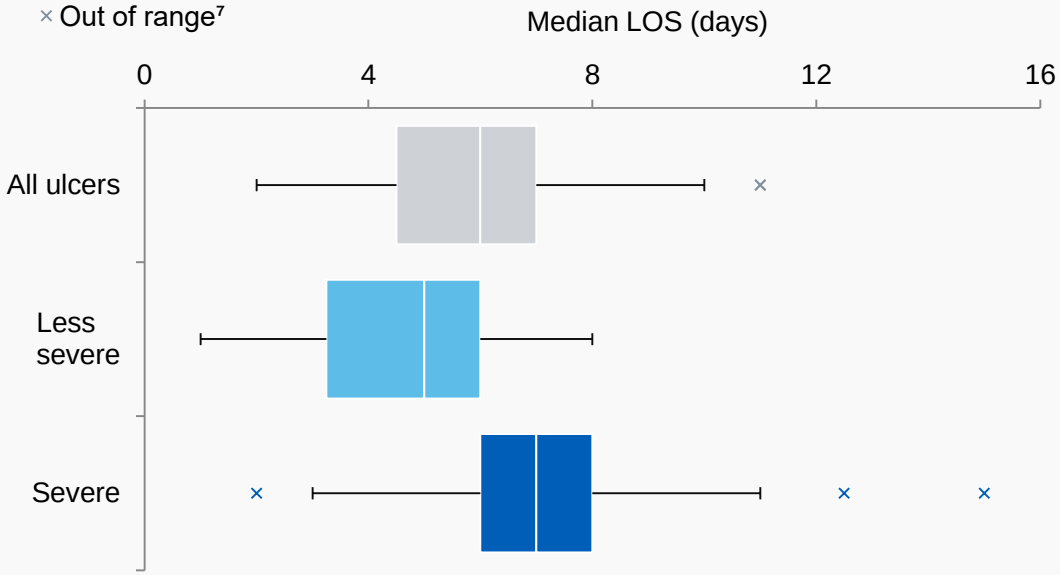
In a **quarter** of care providers, **NDFA patients** accounted for **1,600+ bed days** within 6 months[6]

Equivalent to at least 9 beds occupied by NDFA patients per provider per day

Notes: **1**, **2**, **4**, **6**, **7**. Please refer to list of footnotes in the footnote section.
Please see Glossary (Ulcer characteristics/Which admissions are included?/Length of stay and bed days) for explanation of terms.

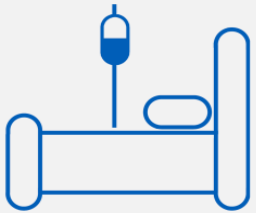
Hospital admissions: Length of stay, by provider

Figure 12: Hospital admissions[2] within 6 months of first expert assessment[1]: median length of stay (days)[5], by provider, by ulcer severity, NDFA patients, England and Wales, 2014-2017



Notes: **1**, **2**, **5**, **7**. Please refer to list of footnotes in the footnote section.
Please see Glossary (Ulcer characteristics /Which admissions are included?/ Length of stay and bed days) for explanation of terms.

The middle **half** of foot care providers had a median length of stay between **3.25 and 6 days** for people with less **severe** ulcers



The middle **half** of foot care providers had a median length of stay between **6 and 8 days** for people with **severe** ulcers

Providers with 50+ ulcers in total

Outcomes: Hospital procedures

Results and Findings

Hospital procedures: Overview

Audit question: What proportion of people with diabetic foot ulcers have lower limb amputation and/or revascularisation procedures in the 6 months following first expert assessment?

Why is this important? Amputation is the most feared and disabling consequence of diabetic foot disease. **Lower limb amputation** is the surgical excision of bone and soft tissue of the foot or leg. **Minor amputation** (below the ankle) is a treatment for serious diabetic foot ulcers in which toes or part of the foot is removed. **Major amputation** (above the ankle) is carried out when all other treatments have failed.

Revascularisation procedures may save limbs from amputation. Revascularisation surgery is used to restore blood flow to tissue where it has become insufficient. The main types of revascularisation are: **angioplasty** (opening up blocked or partially blocked arteries) and **vascular bypass** (re-routing blood around a blocked section of artery).

Like all surgery, there are risks associated with these procedures and long hospital stays and periods of rehabilitation can ensue.

Notes: Please see Glossary (Revascularisation procedures/Amputation procedures/ Which admissions are included?) for further information.

Key findings

Prevalence

- In the 6 months after their first expert assessment 8 per cent of NDFA patients undergo amputation and 8 per cent undergo revascularisation.

Length of stay

- Resultant hospital stays are long – a median of 14 days for amputation and 10 days for revascularisation.

Ulcer severity

- Patients with severe ulcers at first expert assessment were three times as likely to undergo amputation or revascularisation as those with less severe ulcers.

These findings emphasise the impact of ulcer severity at presentation on patient treatment and outcomes.

Hospital procedures: Summary

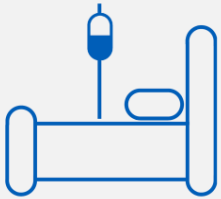
Table 7: Hospital procedures within 6 months of first expert assessment[1]: by procedure type[2], NDFA patients, England and Wales, 2014-2017

Procedure type[2]	All ulcers (17,514 patients)			
	Patients[2]		Admissions[2]	Procedures[2]
	Number	Per cent	Number	Number
Any amputation	**1,469**	**8.4**	**1,667**	**1,841**
… Minor (below the ankle)	1,269	7.2	1,416	1,531
… Major (above the ankle)	293	1.7	299	310
Any revascularisation	**1,352**	**7.7**	**1,524**	**1,958**
… Angioplasty	1,194	6.8	1,301	1,562
… Open procedures	151	0.9	154	177
… Bypass	201	1.1	204	219

Notes: **1**, **2**. Please refer to list of footnotes in the footnote section.
Please see Glossary (Revascularisation procedures / Amputation procedures / Which admissions are included?) for explanation of terms.

8 per cent of people with diabetic foot ulcers undergo **amputation** within **6 months**

2 per cent undergo major amputation



8 per cent of people with diabetic foot ulcers undergo **revascularisation** within **6 months**

Mostly angioplasty (80 per cent)

Hospital procedures: Ulcer severity

Table 8: Hospital procedures within 6 months of first expert assessment[1]: by ulcer severity, NDFA patients, England and Wales, 2014-2017

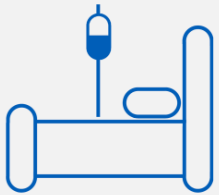
Procedure type[2]	Less severe ulcer (9,401 patients)			Severe ulcer (8,113 patients)		
	Number	Per cent		Number	Per cent	
Any amputation	**370**	**3.9**	*****	**1,099**	**13.5**	*****
… Minor (below the ankle)	329	3.5	*	940	11.6	*
… Major (above the ankle)	65	0.7	*	228	2.8	*
Any revascularisation	**374**	**4.0**	*****	**978**	**12.1**	*****
… Angioplasty	330	3.5	*	864	10.6	*
… Open procedures	49	0.5	*	102	1.3	*
… Bypass	57	0.6	*	144	1.8	*

***** = *statistically significant at the 0.05 level (Less severe vs Severe).* **n** = *not statistically significant*

Notes: **1**, **2**, Please refer to list of footnotes in the footnote section.
Please see Glossary (Revascularisation procedures/Amputation procedures/Ulcer characteristics/ Which admissions are included?) for explanation of terms.

Those with **severe** ulcers are **three times** as likely to undergo **amputation**

14 vs. 4 per cent within 6 months



Those with **severe** ulcers are **three times** as likely to undergo **revascularisation**

12 vs. 4 per cent within 6 months

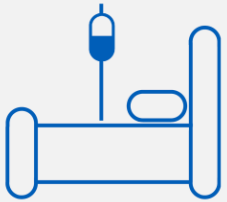
Hospital procedures: Bed days

Table 9: Hospital procedures within 6 months of first expert assessment[1]: bed days, by procedure type, NDFA patients, England and Wales, 2014-2017

Procedure type[2]	Number of hospital admissions	Number of bed days[3, 5]	Length of stay[4]	
			Median	Mean
Any amputation	**1,667**	**28,694**	**14.0**	**20.8**
… Minor only (below the ankle)	1,368	19,099	11.0	17.3
… Major only (above the ankle)	251	7,728	25.0	33.1
Any revascularisation	**1,524**	**21,424**	**10.0**	**17.9**
…Angioplasty only	1,227	15,599	9.0	17.1
…Open procedure only	58	850	8.0	15.6
…Bypass only	119	2,161	15.0	18.5

The median length of **hospital stays** involving **amputation** is **14 days**

Rising to 25 days for major amputation



10 days is the median length for **hospital stays** that involve **revascularisation**

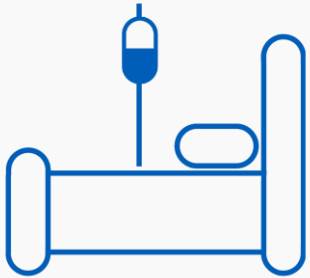
Rising to 15 days for vascular bypass

Notes: **1**, **2**, **3**, **4**, **5**. Please refer to list of footnotes in the footnote section. Please see Glossary (Revascularisation procedures/Amputation procedures/ Length of stay and bed days) for explanation of terms.

Hospital admissions & procedures: Commentary

The audit has found a clear association between ulcer severity at assessment – and therefore also time to assessment - and the likelihood of the patient going on to be admitted to hospital within the next six months. This association holds for all admissions, including revascularisation and amputation. Patients with severe ulcers are more likely to be admitted to hospital, to have longer hospital stays, and to undergo major amputation.

NDFA team



Recommendation

- To reduce the incidence of severe diabetic foot ulcers, and through that reduce admissions, amputations and hospital bed days, healthcare professionals should promptly refer people with diabetic foot ulcers for specialist assessment. Commissioners should ensure that the pathways necessary for this are in place.

Outcomes: Factors associated with amputation

Results and Findings

Factors associated with amputation: Overview

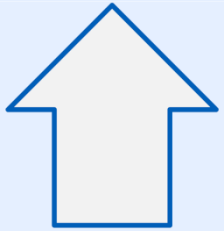
Audit question: What characteristics are associated with patients that go on to have a lower limb amputation within 6 months?

How is this measured? NDFA, NDA and hospital activity data is combined in a logistic regression model that looks for factors that are associated with whether a patient has a minor or major amputation following their first expert assessment.

Why is this important?. If factors associated with amputation can be identified and a strong model produced, the model can adjust local amputation rates to account for providers' unique patient profiles and enable fairer comparisons between services.

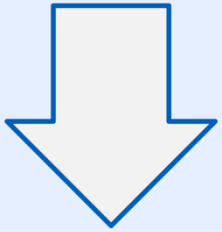
Notes: See Glossary (Statistical terms) for explanation of terms.

Key findings



Better outcomes (not having an amputation) are strongly associated with:

- Having a single foot ulcer



Worse outcomes (having an amputation) are strongly associated with:

- Ischaemia (poor circulation), ulcer depth and size
- Smoking (major amputation)
- Hindfoot ulceration (major amputation)
- Bacterial infection (minor amputation)

Limitations

The overall power of both amputation models is **reasonable** (c-statistics 0.7 to 0.8), with some of the variation in outcome still not explained by the model.

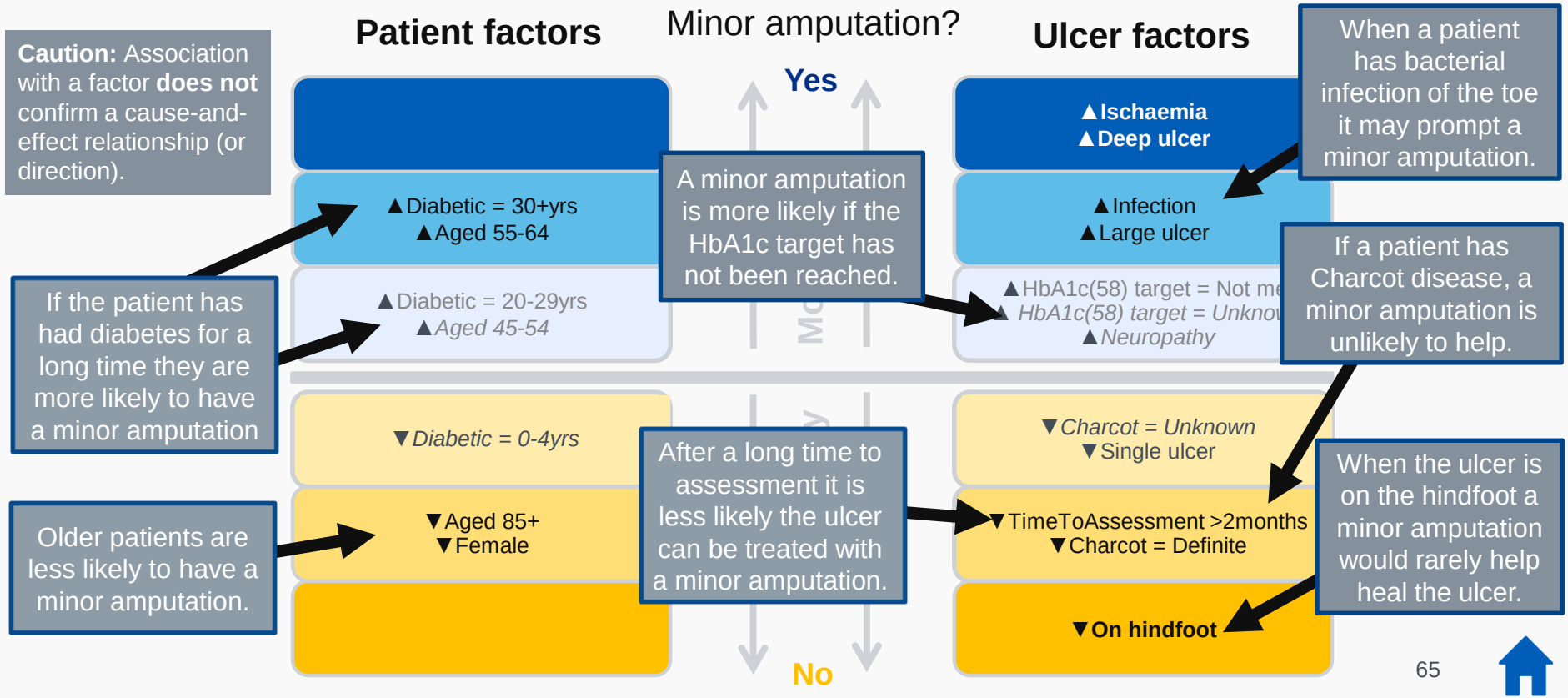
Factors associated with minor amputation: Findings

LIMITATIONS:
The predictive power of the statistical model is **reasonable** (c-statistic 0.7 to 0.8)

Patient factors	Minor amputation?	Ulcer factors
	Yes	▲**Ischaemia** ▲**Deep ulcer**
▲Diabetic = 30+yrs ▲Aged 55-64	More likely	▲Infection ▲Large ulcer
▲Diabetic = 20-29yrs ▲*Aged 45-54*		▲HbA1c(58) target = Not met ▲ *HbA1c(58) target = Unknown* ▲*Neuropathy*
▼*Diabetic = 0-4yrs*	Less likely	▼*Charcot = Unknown* ▼Single ulcer
▼Aged 85+ ▼Female		▼TimeToAssessment >2months ▼Charcot = Definite
	No	▼**On hindfoot**

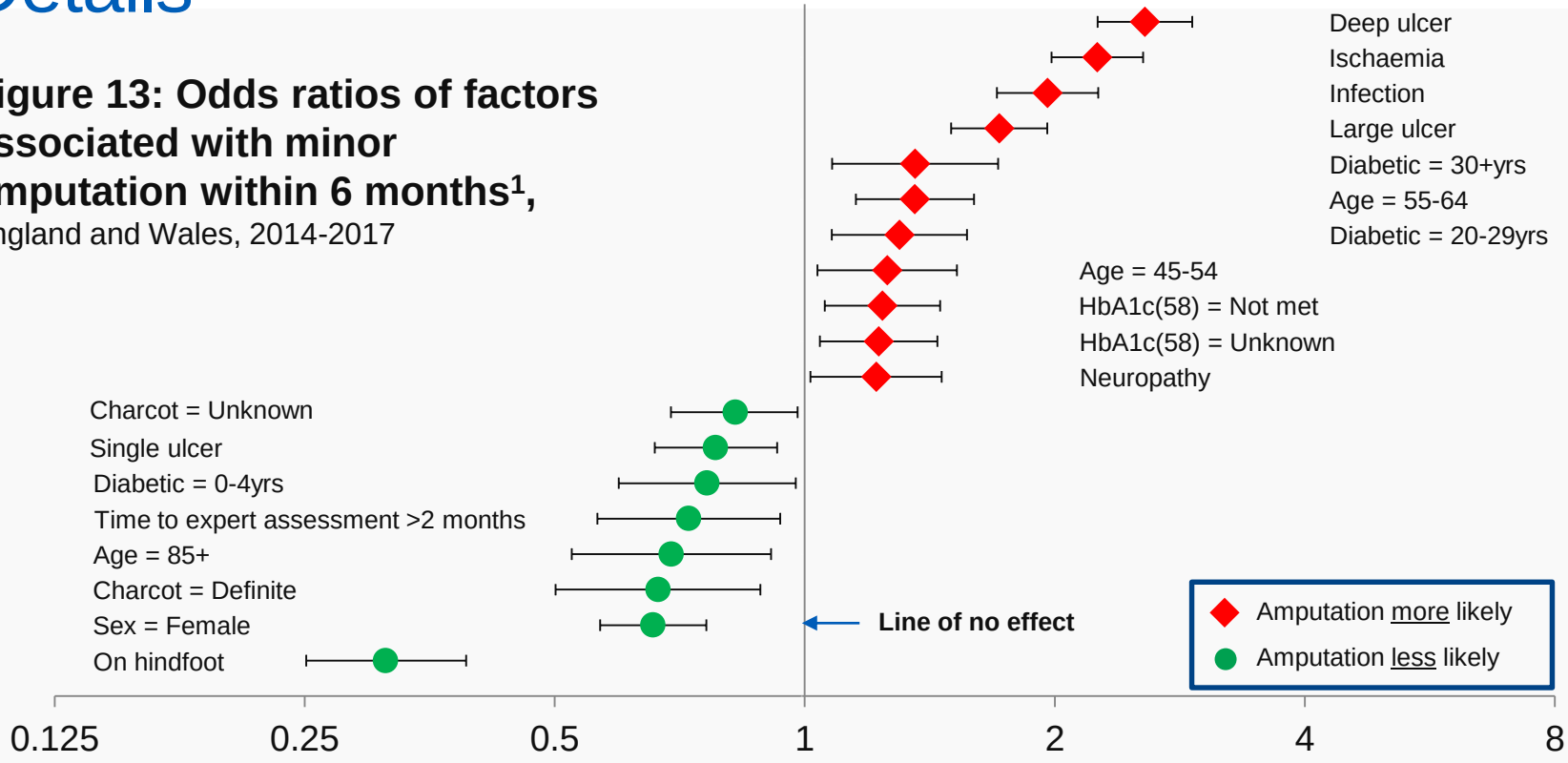
Notes: Italics = confidence interval close to line of no effect (1.0). See Glossary (Statistical terms) for explanation of terms

Factors associated with minor amputation: Commentary



Factors associated with minor amputation: Details

Figure 13: Odds ratios of factors associated with minor amputation within 6 months[1],
England and Wales, 2014-2017



Notes:
1. See Glossary (Statistical terms) for explanation of terms.

Factors associated with minor amputation:
Characteristics tested

Patient characteristics: Association with amputation		
Age at assessment	☑	
Body Mass Index		☒
Care processes		☒
Deprivation quintile		☒
Diabetes duration	☑	
Diabetes type		☒
Ethnicity		☒
Foot surveillance		☒
Sex	☑	
Treatment targets	☑	
Smoking status		☒

Ulcer characteristics: Association with amputation		
Charcot disease	☑	
First ulcer in the audit		☒
Number of ulcers	☑	
Time to assessment	☑	
Ulcer area	☑	
Ulcer depth	☑	
Ulcer infection	☑	
Ulcer ischaemia	☑	
Ulcer neuropathy	☑	
Ulcer site (hindfoot)	☑	
Ulcer severity		☒

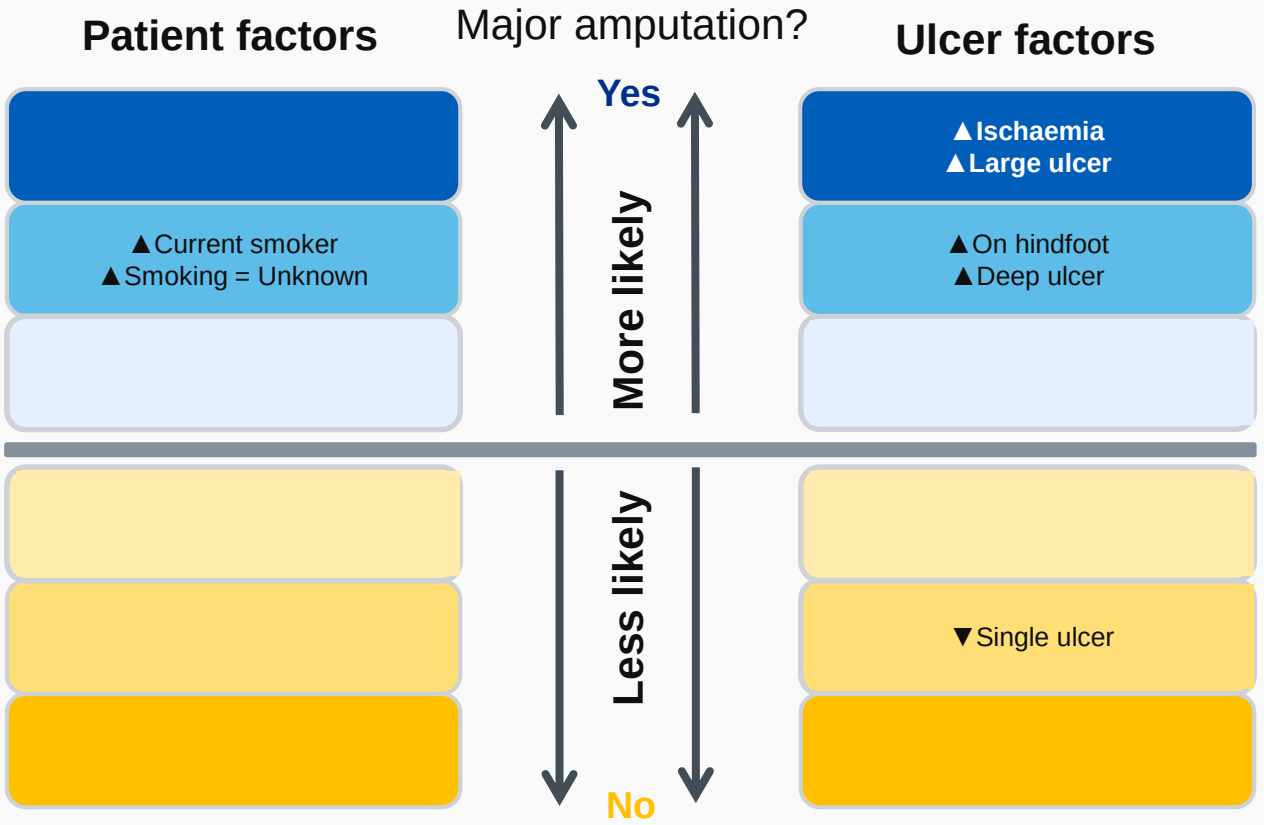
Minor amputation is associated with **four** patient-related factors and **nine** ulcer-related **factors**

Amputations are **more likely** when an ulcer is **deep**, **ischaemic** or **large** in area at first expert assessment

Ulcers on the hindfoot are unlikely to be treated with a minor amputation

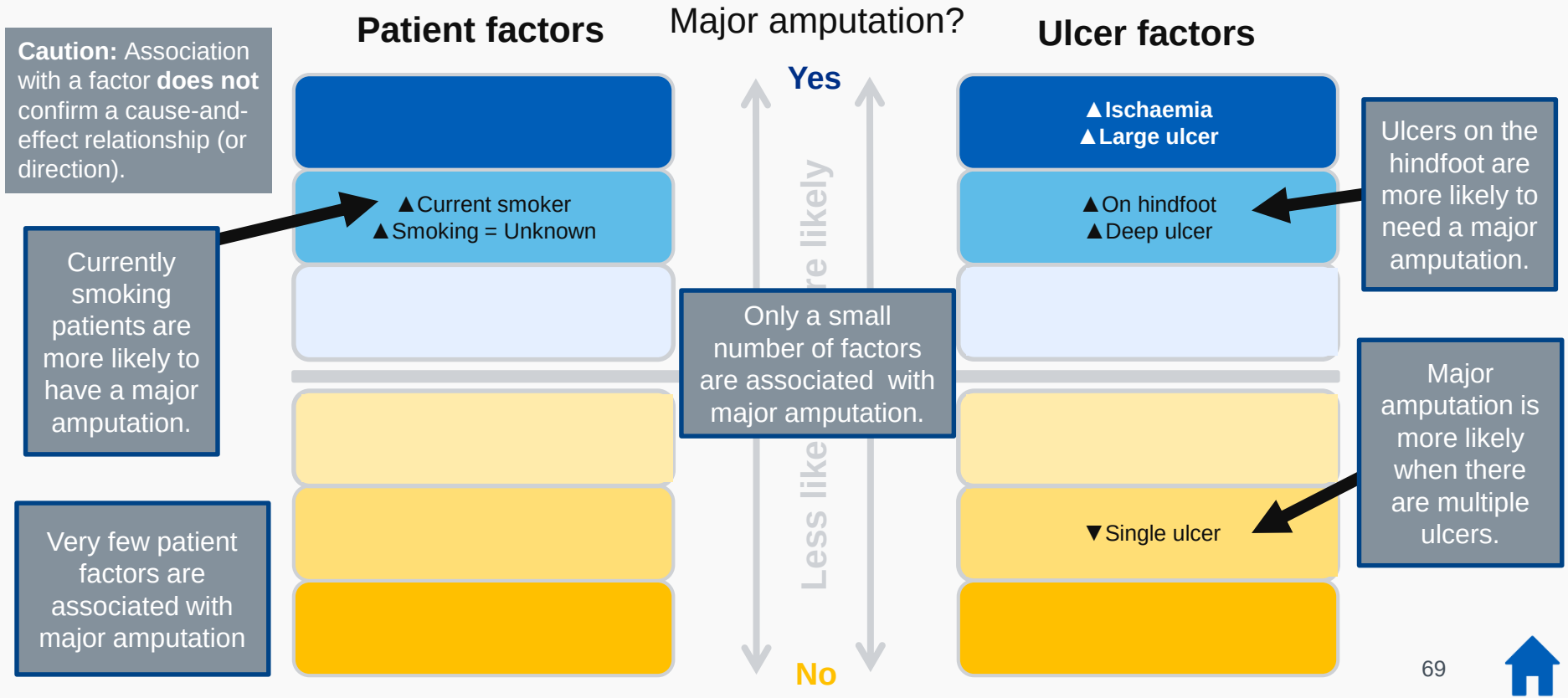
Factors associated with major amputation: Findings

LIMITATIONS:
The predictive power of the statistical model is **reasonable** (c-statistic 0.7 to 0.8)



Notes: Italics = confidence interval close to line of no effect (1.0). See Glossary (Statistical terms) for explanation of terms.

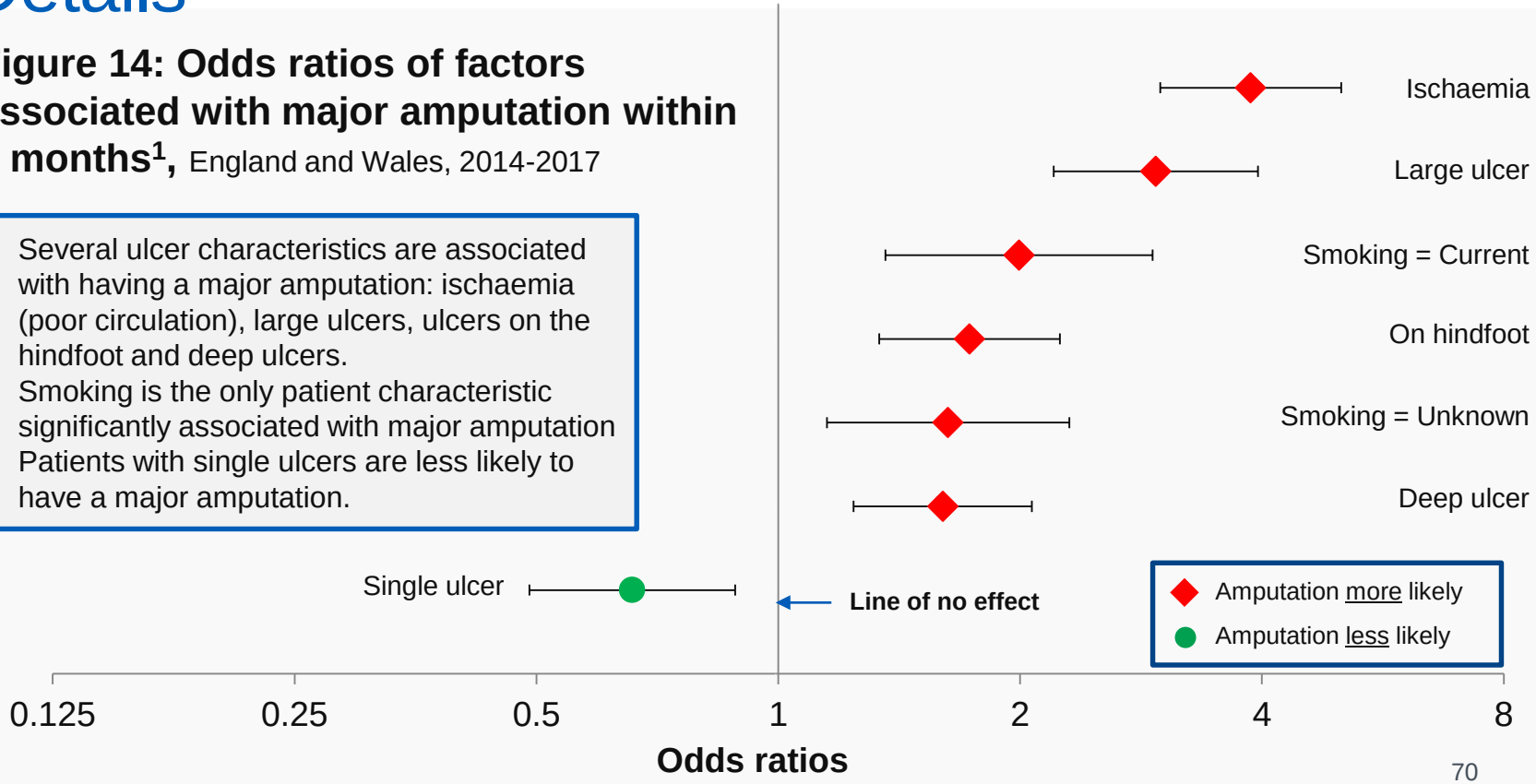
Factors associated with major amputation: Commentary



Factors associated with major amputation: Details

Figure 14: Odds ratios of factors associated with major amputation within 6 months[1], England and Wales, 2014-2017

- Several ulcer characteristics are associated with having a major amputation: ischaemia (poor circulation), large ulcers, ulcers on the hindfoot and deep ulcers.
- Smoking is the only patient characteristic significantly associated with major amputation
- Patients with single ulcers are less likely to have a major amputation.



Notes:
1. See Glossary (Statistical terms) for explanation of terms.

Factors associated with major amputation:
Characteristics tested

Patient characteristics: Association with amputation		
Age at assessment		☒
Body Mass Index		☒
Care processes		☒
Deprivation quintile		☒
Diabetes duration		☒
Diabetes type		☒
Ethnicity		☒
Foot surveillance		☒
Sex		☒
Treatment targets		☒
Smoking status	☑	

Ulcer characteristics: Association with amputation		
Charcot disease		☒
First ulcer in the audit		☒
Number of ulcers	☑	
Time to assessment		☒
Ulcer area	☑	
Ulcer depth	☑	
Ulcer infection		☒
Ulcer ischaemia	☑	
Ulcer neuropathy		☒
Ulcer site (hindfoot)	☑	
Ulcer severity		☒

Only **one** **patient** characteristic is associated with **major** amputation

1 patient factor and 5 ulcer factors

Major amputations are **more likely** when an ulcer is **ischaemic** or large in **area** at first expert assessment

Being a current smoker is associated with having a major amputation

Factors associated with amputation: Commentary

Amputations are serious operations and are only undertaken if thought to be in a person's best interest. They are of two types: **Minor** (which leaves the person with a foot they can stand on) and **Major** (which is undertaken above the ankle). It is known that rates vary by as much as sevenfold[1] between localities.

The NDFA finds that major amputation is more likely if presenting ulcers are wider and deeper, if there is poor circulation and if cigarette smoking is current. If ulcers were less severe at presentation to the expert team, there might be a reduction in the number of amputations. However, it is likely that other factors such as decisions about improving blood flow or managing bone infection are also influential.

NDFA team

Recommendations

- Ensure pathways of care enable new ulcers to be assessed expertly without delay because longer time to assessment is associated with greater ulcer severity.
- Ensure that where poor circulation is a factor, people are promptly assessed for possible revascularisation.

Notes: Public Health England, 2017, Diabetes profiles.

Footnotes

Details

Footnotes:

Participation, Time to first expert assessment

Participation

1. See the NDFA Hospital Admissions Report 2014-2016: Slides 14, 40. Comparisons have also been made with the 2014/17 Public Health England footcare profiles. NDFA amputations in England were equivalent to 11 per cent of major amputations and 21 per cent of minor amputations that had been identified by PHE.
2. The 2014-15 audit year covered eight full months from 14 July 2014 to 31 March 2015.
3. See National Diabetes Audit - 2015-2016: Report 1, Care Processes and Treatment Targets

Time to first expert assessment

1. The NICE guidelines for Diabetic foot problems: prevention and management http://www.nice.org.uk/guidance/ng19. Recommendation 1.3.8.

Footnotes: Care Structures Survey

Care Structures Survey

1. The NICE guidelines for Diabetic foot problems: prevention and management http://www.nice.org.uk/guidance/ng19.
2. Recommendations 1.3.3-7 from the NICE guidelines for Diabetic foot problems: prevention and management.
3. Recommendation 1.3.8 from the NICE guidelines for Diabetic foot problems: prevention and management.
4. Recommendations 1.4.1-2 from the NICE guidelines for Diabetic foot problems: prevention and management.
5. ‘Full responders’ are organisations that responded to the structures survey, answering either yes or no to each of the three questions.

Footnotes: Alive and ulcer-free

Alive and ulcer-free

1. The capacity to record whether a patient was lost to follow up was added to the audit system in August 2016. Patients who have been lost and were recorded in the audit prior to this date may appear as an ‘unknown’ outcome instead of ‘lost to follow up’.
2. ‘Alive and ulcer-free’ includes those patients who have had surgery (including major and minor amputation), provided all wounds have healed.
3. Crude death rate. Office for National Statistics (ONS) mortality tracing is pending approval, so the number of reported deaths in NDFA may be underestimated.
4. The ‘Known’ denominator excludes ulcers with an unknown outcome, and those lost to follow-up who are no longer under the care of the foot care service.
5. The patient was alive and ulcer-free at 12 weeks, and developed further ulceration in the next 12 weeks.
6. Provider organisations are only included in this analysis if they saw at least 50 relevant ulcer episodes in 2014-2017.
7. Providers with outcome rates outside the interquartile range (IQR) by more than 1.5 times the IQR are shown as ‘out of range’.

Footnotes: Hospital admissions

Hospital admissions

1. From first assessment by the specialist foot care service in the NDFA prior to 2017. Includes admissions that were ongoing at first expert assessment. Please see Glossary: Which admissions are included? for further information.
2. Admitted to hospital for any reason.
3. Foot disease identified at any point during the admission. Please see Glossary: Foot disease-related admission for further information.
4. Only includes bed days within the 6 months following first expert assessment. Excludes day cases. Please see Glossary: Length of stay and bed days for further information.
5. The entire hospital stay is included, including time after the 6 month cut-off and prior to the first assessment, where applicable. Excludes day cases. Please see Glossary: Which admissions are included? for further information.
6. Low NDFA case ascertainment means that the total figure across the NHS could be ten times that reported in the audit. See Footnotes: Participation 1 for further information.
7. Providers with bed-days outside the interquartile range (IQR) by more than 1.5 times the IQR are shown as ‘out of range’.

Footnotes: Hospital procedures

Hospital procedures

1. Patients are included where their first assessment by the specialist foot care service in the NDFA took place prior to 2017. Admissions that were ongoing at first expert assessment are included. Please see Glossary: Which admissions are included? for further information.
2. A single patient may undergo multiple revascularisation/amputation procedures.
3. Only includes bed days within the 6 months following first expert assessment. Excludes day cases. Please see Glossary: Length of stay and bed days for further information.
4. The entire hospital stay is included, including time after the 6 month cut-off and prior to the first assessment, where applicable. Excludes day cases. Please see Glossary: Which admissions are included? for further information.
5. Low NDFA case ascertainment means that the total figure across the NHS could be ten times that reported in the audit. See Footnotes: Participation 1 for further information.

Glossary

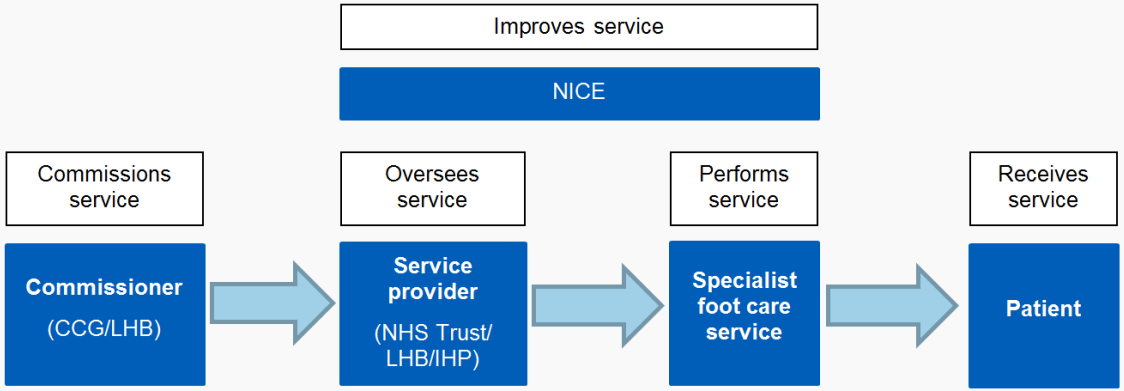
Information and definitions

Glossary: Healthcare providers

NDFA data is submitted by **specialist foot care services** that treat people with diabetic foot ulcers. This includes community and hospital based organisations.

Service providers are the specialist foot care service's parent organisation. This is typically an **NHS Trust** in England or a **Local Health Board** (LHB) in Wales. It may also be an independent healthcare provider (IHP).

Commissioners decide what health services are needed and ensure that they are provided. Clinical Commissioning Groups (CCG) in England and LHBs in Wales are responsible for commissioning healthcare services.



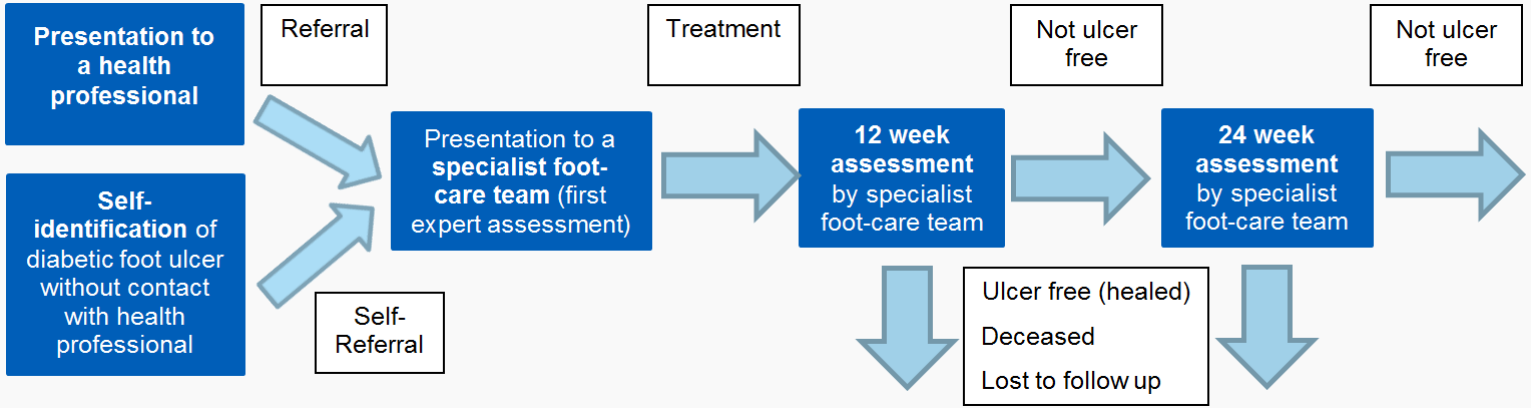
The National Institute for Health and Care Excellence (**NICE**) produces guidelines for the treatment of diabetic foot problems. All diabetes foot care services should follow these guidelines, so that people with diabetes receive the best possible foot care.

Glossary: Patient pathway

The **first expert assessment** of the foot ulcer is undertaken by the specialist foot care service. Patients may self-refer to the specialist foot care service (**self-referral**) or they may be referred following **presentation to a health professional** (e.g. GP community team, Accident and Emergency or another specialist foot care service).

At 12 and 24 weeks following the first expert assessment, the specialist foot care service will record whether the patient is **alive and ulcer-free** (i.e. all ulcers present at the start of this episode have fully healed and no other ulcers remain unhealed). Being ulcer-free also includes those patients who have had surgery (including major and minor amputation), provided all wounds have healed. **Persistent ulcers** are ulcers that have not healed.

Healed at 12 weeks includes all ulcer episodes reported as healed at 12 weeks. **Healed at 24 weeks** includes all ulcer episodes reported as healed at 24 weeks plus those reported as healed at 12 weeks, unless a new ulcer episode occurred within 12 weeks of their 12 week assessment.



Glossary: Referrals to the foot care service

People seen by the specialist foot care service are generally referred to the foot care team by a health professional.

This will often be by a general practitioner (GP) who has identified a foot ulcer. Less often it will be by a hospital consultant – where a patient is referred after attending an A&E department, or after they have been seen by a specialist in another department (such as orthopaedics, renal services or dermatology). People may also be referred by community nurses, or another part of the specialist diabetes service.

Some people are seen by the specialist service after they have ‘self-referred’. These people have usually had an earlier foot ulcer and know the foot care team, or may have been identified as high-risk and attend a foot protection service. They will have been encouraged to contact the specialist foot care service at the first sign of trouble.

Most people with diabetes that develop a new foot ulcer **do not** and **cannot** refer themselves directly to a specialist foot care service and **must be referred by a health professional** – usually their GP.

Glossary: Care structures

The three NDFA Care Structures Surveys conducted in 2015, 2016 and 2017 asked commissioners in England and Wales (NHS Trusts and Local Health Boards) whether the following three care structures were in place:

1. **Training for routine diabetic foot examinations** (NICE NG19 recommendations 1.3.3-7)

Is there a CCG/LHB wide training programme designed to ensure that all responsible healthcare professionals have the necessary competence to undertake foot risk examinations as part of routine annual diabetes review?

2. **Foot protection service pathway** (NICE NG19 recommendations 1.3.8)

Is there an established pathway for referral of all people with diabetes who are defined as being at increased risk during annual foot examination to a designated Foot Protection Service? Such referral should enable further expert assessment and long term risk management. Contractual standards should include:

- Waiting times
- Re-call and review processes
- Referral thresholds and pathways into and back from the expert Multi-disciplinary Foot Care Team or Service (MDFT or MDFS).

3. **Referral for assessment pathway** (NICE NG19 recommendations 1.4.1-2)

For a person with new, deteriorating or recurrent diabetic foot disease is there an established pathway which can allow referral to an expert assessment within 24 hours, if needed?

Glossary: Ulcer characteristics

Ulcer characteristics are measured at the first expert assessment by the specialist foot care service. Overall **ulcer severity** is recorded using the **SINBAD** scoring system, which scores an ulcer between 0 (least severe) and 6 (most severe) depending on how many of the 6 SINBAD elements are present. The 6 **SINBAD elements** are:

- ❑ **Site (on hindfoot)** – Ulcer penetrates the hindfoot (rear of the foot).
- ❑ **Ischaemia** – Impaired circulation in the foot.
- ❑ **Neuropathy** – Loss of protective sensation in the foot.
- ❑ **Bacterial infection** – Signs of bacterial infection of the foot

(e.g. redness, swelling, heat, discharge).

- ❑ **Area (≥ 1cm^2)** – Ulcer covers a large surface area (1cm^2 or more).
- ❑ **Depth (to tendon or bone)** – Ulcer penetrates to tendon or bone.

An ulcer with a SINBAD score of 3 or above is classed as a **severe ulcer**.

An ulcer with a SINBAD score of less than 3 is classed as a **less severe ulcer**.

Charcot foot disease is a type of serious bone deformity associated with neuropathy.

Glossary: Statistical terms (1)

Where a result is flagged as **significant at 0.05 level**, there is only a 5 per cent probability that the result is due to chance.

Logistic regression is used to examine the relationship between an outcome (e.g. alive and healed at 12 weeks) and related variables (e.g. ulcer characteristics). Backwards elimination is used to remove variables found not to be significant at 0.05 level, producing a final model that includes variables with significant associations only

Two outputs are particularly useful when interpreting the results of a logistic regression model:

- The **c-statistic** can be used to assess the goodness of fit, with values ranging from 0.5 to 1.0. A value of 0.5 indicates that the model is no better than chance at making a prediction of membership in a group and a value of 1.0 indicates that the model perfectly identifies those within a group and those not. Models are typically considered reasonable when the c-statistic is higher than 0.7 and strong when the c-statistic exceeds 0.8 (Hosmer and Lemeshow, 2000).
- **Odds ratios** (OR) illustrate how strongly a particular value of a variable is associated with the outcome. The further from one the ratio is (either above or below), the stronger the association between it and the outcome. For example, an odds ratio of 0.764 would suggest a stronger association than an odds ratio of 0.830. An odds ratio of one would show that the variable value has no bearing on how likely the outcome is.

  There is always a degree of uncertainty in the calculated odds ratio. This is described by the **confidence interval**. The wider the confidence interval, the less certainty there is in the odds ratio. If the confidence intervals are either side of 1 this indicates that the value taken by the variable has no bearing on how likely the outcome is. Where the confidence interval approaches 1 this indicates that the association with the outcome may be weak.

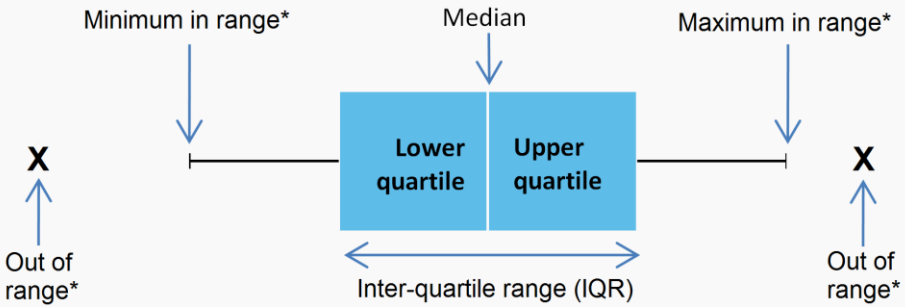
Glossary: Statistical terms (2)

Quartiles: Lists of values can be ranked numerically from lowest to highest.

- The **median** is the middle value in the ranked list.
- The **lower quartile** is the middle value of the lower half of the ranked list.
- The **upper quartile** is the middle value of the upper half of the ranked list.
- The **interquartile range** represents values between the lower and upper quartiles – the middle 50 per cent of the values in the ranked list.

  - The interquartile range, along with minimum and maximum range values, can be plotted on a **box and whisker plot** – see example right.
  - Values outside 1.5xIQR below the lower quartile and 1.5xIQR above the upper quartile are shown as points outside the plot.

Box and whisker plot



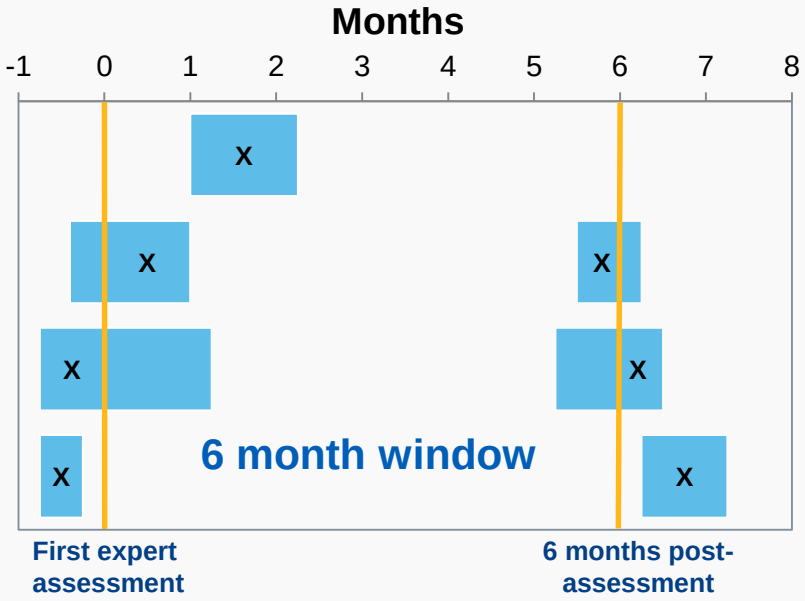
- The **mean** is the average of the values in the list. The mean may be higher or lower than the median, depending on the extent to which the data is skewed (e.g. by very large values).

Glossary: Which admissions are included?

All admissions includes all hospital stays within or overlapping with the 6 month period after first assessment by the specialist foot care team (Stories **A**, **B**, and **C** below). Subsets include:

- **Foot disease** admissions, where foot disease is identified at any point during the hospital admission, including outside the 6 month window (Stories **A**, **B**, and **C** below, where event X is the start of the episode of care where foot disease is identified). This ensures that all admissions where foot disease is a significant factor are included.
- **Revascularisation** and **amputation** admissions, where the related procedures occur within the 6 month window (Stories **A** and **B** below, where event X is the relevant procedure date). Using this criteria ensures that the currency used for analysis (procedures undertaken within 6 months) is simple and easy to understand.

Story	Admission included?			
	All admissions	Where event X is…		
		Foot disease	Revascul-arisation	Amput-ation
A. Admission and event X occurs within 6 month window	**Yes**	**Yes**	**Yes**	**Yes**
B. Admission overlaps with 6 month window, event X occurs within 6 month window	**Yes**	**Yes**	**Yes**	**Yes**
C. Admission overlaps with 6 month window, event X occurs outside 6 month window	**Yes**	**Yes**	*No*	*No*
D. Admission and event X outside 6 month window	*No*	*No*	*No*	*No*

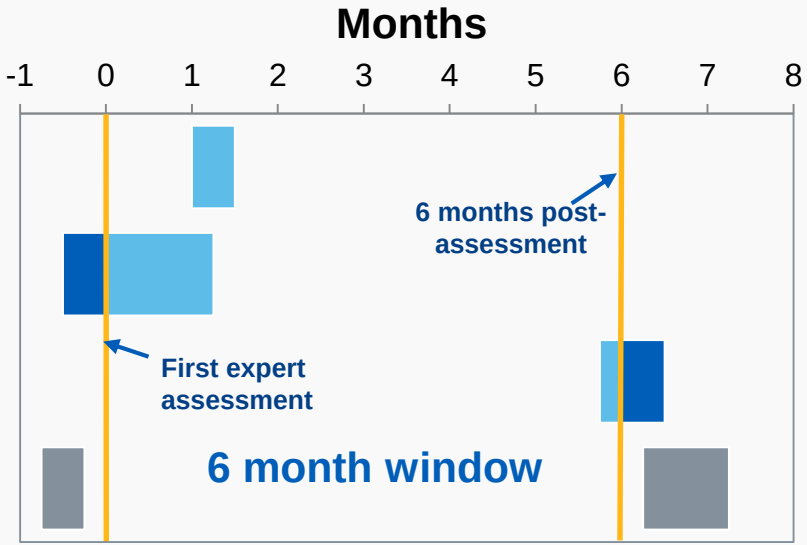


Glossary: Length of stay and bed days

The full duration of the hospital admission contributes towards the **length of stay**, including days outside the 6 month window. This ensures that hospital stays that overlap with the beginning or end of the 6 month window are not artificially shortened. Length of stay is reported using the median (middle) value, which prevents skewing of results by very long stays.

Bed days are only counted if they occur within 6 months of first assessment by the specialist foot care service. This ensures that the currency (bed days within 6 months of first expert assessment) is easy to understand and also prevents patients with very long stays (e.g. long-term mental health admissions) from inflating the total.

Story	Admission included?
Admitted and discharged within 6 month window	Yes
Admission overlaps with assessment, concluded within 6 months	Yes
Admission overlaps with end of 6 month window	Yes
Admitted and discharged outside 6 month window	No



Key	Length of stay counted?	Bed days counted?
	Yes	Yes
	Yes	No
	No	No

Glossary: Foot disease-related admissions

Diabetic foot disease is defined as a foot affected by ulceration that is associated with neuropathy and/or peripheral arterial disease of the lower limb in a patient with diabetes[1].

People with diabetic foot ulcers sometimes require admission to hospital to treat their foot disease. This occurs when the condition of the foot threatens survival of either the foot or the patient. Such deterioration is often a result of infection (requiring intravenous antibiotics, with or without local surgery) or poor arterial blood flow. Resultant hospital stays and rehabilitation may be lengthy. In extreme cases amputation is required.

To identify foot disease-related admissions, all episodes of hospital care have been searched for the following **clinical procedures** or **diagnoses** predominantly associated with inpatient management of diabetes related foot disease[2]:

Foot disease clinical diagnoses

- Diabetes mellitus with peripheral circulatory complications
- Ulcer of the lower limb
- Decubitus ulcer
- Cellulitis
- Osteomyelitis
- Gangrene
- Atherosclerosis

Foot disease clinical procedures

- Debridement of a foot/leg wound
- Minor and major amputation of lower limb

For reporting purposes, the foot disease may be identified at any point during the hospital admission. Single patients may have more than one admission and/or foot disease type.

Notes: **1**. Alexiadou, K and Doupis, J (2012).
2. Public Health England (2017). Patients may have other conditions which are contributing factors towards their hospital stay.

Glossary: Revascularisation procedures

People with diabetes are more likely to experience problems with poor circulation than people who don't have diabetes. Circulation problems can be treated non-surgically, but in some cases a person will need to undergo a surgical procedure in hospital to improve blood flow to tissue where it has become restricted.

Revascularisation describes the types of operations that restore blood flow[1]. Most revascularisation procedures can be grouped into two types:

1) **Angioplasty**, which involves inserting a balloon where blood flow is restricted and then inflating it to widen the blood vessel. It is usually a relatively non-invasive procedure.
2) **Vascular bypass**, which is an open procedure that involves making a blood vessel graft which travels around, or bypasses, the blood vessels which are restricted or blocked. It is generally a more complex procedure than an angioplasty.
3) Other types of **open procedure** including endarterectomy, a surgery which involve opening the artery and cleaning the away the deposits which are causing the blockage.

For reporting purposes, revascularisation must occur within 6 months of first expert assessment by the specialist foot care service. Any one patient may have more than one revascularisation-related admission and/or revascularisation procedure.

Notes: **1**. The revascularisation coding used in the report was supplied by the National Vascular Registry.

Glossary: Amputation procedures

Amputation, or surgical removal, of part of the foot or leg may be required when a diabetic foot ulcer cannot otherwise be successfully treated. When this is the case then an operation is needed to surgically excise bone and soft tissue in order to allow healing.

This may be a **minor amputation (below the ankle)** in which toes or part of the foot are removed in an attempt to save the leg. When this is not possible, **major amputation (above the ankle)** may be required.

Amputation is a life-changing event, with significant physical and psychological effects. Long hospital stays and periods of rehabilitation can result.

For reporting purposes, amputation must occur within 6 months of first expert assessment by the specialist foot care service. Any one patient may have more than one amputation-related admission and/or amputation procedure.

Further information

Audit references

Further information: Summary

For more information on the National Diabetes Foot Care Audit or access to the Service Level Analysis, please visit the NDFA webpage at http://content.digital.nhs.uk/footcare.

For further information about this report, please contact NHS Digital's Contact Centre on 0300 303 5678 or email enquiries@nhsdigital.nhs.uk.

Further information: References

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- **NICE Guidelines**: Diabetic foot problems: prevention and management; January 2016; http://www.nice.org.uk/guidance/ng19
- **NHS Digital** (2017) National Diabetes Audit, Report 1: Care Processes and Treatment Targets 2016-17 https://digital.nhs.uk/catalogue/PUB30142
- **NHS Digital** (2017) National Diabetes Foot Care Audit - 2014-2016 https://digital.nhs.uk/catalogue/PUB23525
- **NHS Digital** (2017) National Diabetes Foot Care Audit Hospital Admissions Report 2014-2016 https://digital.nhs.uk/catalogue/PUB30107
- **Public Health England** (2017): Diabetes footcare profiles https://fingertips.phe.org.uk/profile/diabetes-ft
- **South East Coast Strategic Clinical Networks** (2015) Patients with Diabetes Foot Care. Commissioning Guidance and Sample Service Specification

Further information: Acknowledgements

The NDFA team would like to thank all the teams who have worked hard to contribute to this unique and valuable insight into the care and outcomes of people with diabetic foot ulcers.

Development and delivery of the NDFA is guided by a multi-professional advisory group of clinicians and patient representatives, chaired by Professor William Jeffcoate. The NDFA Advisory Group members include:

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Sue Brown	Patient representative
Sophie Colling	NDA Project Support Officer, Diabetes UK
Laura Fargher	NDA Engagement Manager, Diabetes UK
Catherine Gooday	FDUK & Principal Diabetes Podiatrist, Norfolk & Norwich University Hospital
Michelle Goodeve	Diabetes Lead Podiatrist, Broomfield Hospital, Chelmsford
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Naomi Holman	Methodology advisor, University of Glasgow
Roy Johnson	Patient representative
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Corinne Wykes	Patient representative
Arthur Yelland	Senior Information Analyst, NHS Digital

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Prepared in collaboration with:

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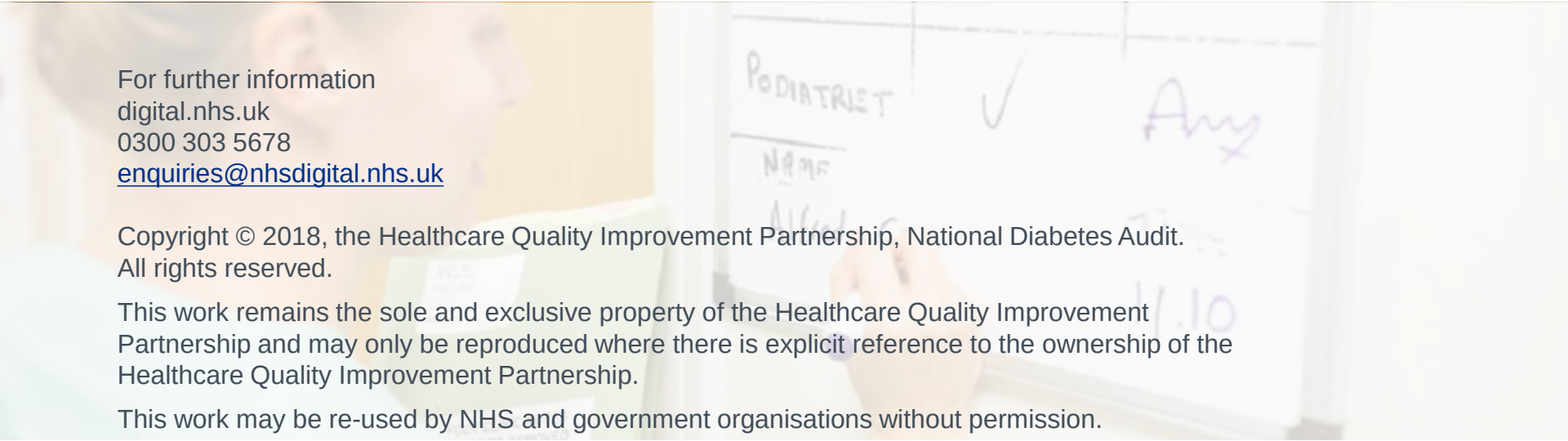

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