# ‘Losing’ joint mobility in feet and podiatry practice: a qualitative investigation of the role of limited joint mobility in the clinical assessment of the diabetic foot

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**Citation:** Newton V, Williams A, Findlow A et al (2018) ‘Losing’ joint mobility in feet and podiatry practice: a qualitative investigation of the role of limited joint mobility in the clinical assessment of the diabetic foot. *The Diabetic Foot Journal* 21(4): 254–9

**Article points**

1. Previous research suggests limited joint mobility (LJM) is important in understanding the risk of diabetic foot ulceration and should be assessed clinically.
2. There is uncertainty in the evidence base regarding the characteristics of LJM and variability in the way it is assessed.
3. This study explored podiatrists’ opinions on the characteristics of LJM, including their approaches to assessment and management.

**Key words**

- Clinical practice
- Diabetes
- Guidelines
- Limited joint mobility

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**According to research, limited joint mobility (LJM) is a potential risk factor for diabetic foot ulceration. Previous studies have attempted to assess its severity by measuring joint range of movement. Others have attempted to measure changes in skin and connective tissue, which are thought to be associated with limited joint mobility. No firm agreements exist in the evidence base regarding the characteristics of LJM or its clinical assessment. This has the potential to create difficulties for application in clinical practice. For that reason, this study aimed to explore some podiatrists’ opinions on the characteristics of LJM and the application of guidelines in relation to its assessment. A focus group method was used to explore opinions on the characeristics and experiences of assessing LJM. Discussion was led using questions originating from the literature on LJM. Following verbatim transcription, thematic data analysis was used to identify the main themes, which were then interpreted. Several themes emerged: LJM being relatively ignored in assessment routines, difficulties defining it, difficulties in clinically assessing for it, pragmatic factors affecting time, and a guideline driven practice culture. Collectively, these offer important insight into these podiatrists’ understanding of the characteristics of LJM. This study provides a unique and timely opportunity to consider the impact of discord between research evidence, clinical guidelines and the practical reality of current practice. In addition, the study presents for the first time how practitioners understand the characteristics of LJM.**

Limited joint mobility (LJM) is thought to contribute to the genesis of diabetic foot ulcers (DFUs) (Zimny, 2004). Formosa (2013) highlighted the importance of assessing for foot deformity and reduced joint mobility in diabetes because deformites can be predictive of ulceration and LJM can contribute to foot complications. The International Working Group on the Diabetic Foot (IWGDF, 2015) provides a foot screening assessment sheet containing items that put the foot at risk of ulceration, this includes checking for loss of joint mobility (*Table 1*). However, joint mobility assessment is not a standard recommendation in UK guidelines (NICE, 2016).

Therefore, while it is considered an important factor associated with DFU, there is no consistent message in the literature for assessing joint mobility, nor is there a clear definition as to what LJM is in the context of the pathological changes occuring in the diabetic foot, the risk factors for ulceration and reulceration.

Hence, the aim of this study was to explore podiatrists opinions about LJM, its importance in

the development of foot ucleration and how it is, or should, be assessed. A secondary aim was to develop an understanding of the characteristics of LJM.

In order to provide the context for the focus group with podiatrists, it was necessary to explore previous research about LJM in the foot affected with diabetes. This process informed the focus group facilitator and helped to create the questions that were aimed at exploring the definition of LJM and then how it is assessed (or not).

## Evidence for Limited joint mobility in the foot

There is agreement in the literature that LJM leads to skin thickening and stiffening (Rosenbloom, 1974) due to tissue glycation, which is associated with joint contractures in the hand (Papanas, 2010). LJM in the foot is likely to involve a complex interplay of tissue changes (Frost, 2001) with several structural (Guiotto, 2012) and functional features (Gelber, 2014). Assessment of these changes has implications for clinical practice for detecting LJM and its contribution to DFU.

## Tissue changes

Craig (2008) suggested that increased plantar fascia thickness, a possible index of tissue glycation, may be a more valid indicator of LJM than traditional measures such as examination by passive extension of affected joints. In addition, D'Ambrogi (2003) believed that thickening of the plantar fascia may contribute to decreased joint mobility and increased pressure under the metatarso-phalangeal joints. Abouesha (2001) indicated that decreased thickness of plantar subcutaneous tissues was correlated with increases in plantar pressures. In contrast, Naemi (2017) recently associated increased plantar tissue thickness and lower-tissue stiffness to an increased risk of DFU.

## Structural features

Changes in joint structure and foot shape may also be factors related to LJM and risk of DFU. Garcia Alvarez (2013) and Guiotto (2012) investigated joint range of motion, foot kinematics and plantar presssures in relation to foot morphology and did not suggest any specific structural or functional features that could be associated with LJM. Bus (2002) indicated foot architecture, joint contractures and deformities may be due to changes in sensory/motor systems, rather than soft tissue or structural changes in foot joints.

**Table 1. Items that put the foot at risk of foot ulceration. Information sourced from an original illustration (adapted from IWGDF, 2015).**

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|---|
| Foot ulcer — presence of a full thickness ulcer (yes/no) |
| Risk factors for foot ulceration — neuropathy |
| Monofilament undetectable (yes/no) |
| Tuning fork undetectable (yes/no) |
| Cotton wool undetectable (yes/no) |
| Foot pulses — tibial posterior artery absent (yes/no) |
| Dorsal pedal artery absent (yes/no) |
| Other |
| Foot deformity or bony prominences (yes/no) |
| **Loss of joint mobility (yes/no)** |
| Signs of abnormal pressure such as callus (yes/no) |
| Discoloration on dependency (yes/no) |
| Poor foot hygiene (yes/no) |
| Inappropriate footwear (yes/no) |
| Previous ulcer (yes/no) |
| Amputation (yes/no) |

These uncertainties in the literature reflect a diversity of views on LJM and make it challenging to define. This subsequently makes it difficult to conclude how LJM might be best assessed clinically and understand how it contributes to DFUs in practice. Inconsistencies in the literature concerning the important features of LJM, such as as soft tissue, joint motion or other components, might be a barrier to agreeing clear standards in guidelines advocating assessment of LJM. This was reflected in the exclusion of LJM from the Podus study protocol (Crawford, 2013). Other barriers may be a requirement for specialist assessment methods, such as ultrasound, whereas assessment for LJM may be adopted routinely if based on simple clinical techniques.

It follows that the aim of this study will explore podiatrists opinions about LJM, its importance in the development of foot ucleration and how

**Page points**

1. A focus group design was selected for the study and participants were recruited via a diabetes specialist interest group.
2. Thematic analysis was used to identify the main themes within the text and make transparent the data analysis.
3. The researchers drew on their own reflections as a podiatrist and experience of managing patients with limited joint mobility (LJM) in order to understand the participants experience of LJM in clinical practice.

**Table 2. A list of the focus group questions.**

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|---|
| Question 1. What do you think causes LJM? |
| Question 2. What you think the most important factors are, regarding LJM in the diabetic foot? |
| Question 3. In your clinical practice, how do you detect LJM in the foot? |
| Question 4. What does the shape of the foot look like with LJM? |
| Question 5. How does LJM affect the way the foot works? |
| Question 6. How does the presence of LJM in the foot affect your management? |
| Question 7. What role does ethnic background have on LJM in the foot? |

**Table 3. the 5 stages from the model developed by Braun and Clarke (2006).**

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|---|
| 1. Familiarisation with the data |
| 2. Generating initial codes |
| 3. Searching for themes |
| 4. Reviewing themes |
| 5. Defining and naming themes |

it is, or should, be assessed. This will develop an understanding of the characteristics of LJM.

## Data collection method

A focus group design was selected for the study and participants were recruited via a diabetes specialist interest group. A purposive sample framework was used, and demographics of participants included the following characteristics: a mixed gender group, podiatry experience in diabetes care (spanning 5–20 years), and employed in different NHS locations.

## Procedures

Ethical approval procedures were adhered to aligned to the authors institutional policies. Ten members volunteered to participate and provided written consent. The focus group took place where the participants previously met as a specialist interest group, providing a familiar and private environment. The focus group was facilitated by VN with an independent observer (AF) and (AG) took field notes. The focus group was led using questions (*Table 2*) with additional prompts created by the first author (VN) based on the literature and agreed with the wider research team.

The digitally recorded focus group lasted 1 hour and all participants contributed to the discussion. The first author transcribed the dialogue verbatim. *Table 3* shows a list of the focus group questions

## Data analysis

The participants individually verified the transcription to support the trustworthiness of the data. Thematic analysis was used to identify the main themes within the text and make transparent the data analysis. The process was based on a thematic analysis model shown in *Table 4* (Braun and Clarke, 2006).

However, another stage was supplemented to add an interpretative dimension. This was the Interpretative phenomenological analysis approach (Smith, Flowers and Larkin, 2012) shown in *Table 5* to reflect this was a study of human experience.

While the use of IPA in focus groups does not have the same status as its use in interviews, it is possible to adjust the IPA method for group data (Eatough, 2010).

## Findings and analysis

Consistent with an IPA approach (Smith et al, 2009; Eatough, 2010), the researcher drew on her own reflections as a podiatrist and experience of managing patients with LJM in order to understand the participants experience of LJM in clinical practice.

The research team evaluated the validity of the data extracting exemplars to demonstrate truthfulness of the data within each theme. This provided a rich mix of individual participant experiences and group views. The final themes in *Table 6* represent a meaningful, honest and faithful representation and interpretation of the conversation with the focus group participants. Respondants are identified numerically 1–10 in the rest of the article (R1–R10).

## Theme 1 — Fallen off the radar

This theme suggests LJM was relatively ignored in clinical practice, all participants agreed they were concentrating on other aspects of assessment. Several ideas emerged to contextualise why this was the case. These related to time pressures, constraints imposed by guidelines and the focus of assessment being on

other risk factors. LJM was specifically described as being "…off the radar…", while R5 and as R3 revealed, "…people didn't bother any more".

## Theme 2 — Pass the LJM glasses please

This theme captures various perspectives in characterising LJM in clinical practice. Participants described the range of LJM characteristics from their experience and concluded that LJM did not have a fixed appearance, as R1 suggests: "I think in reality it's a lot of different shapes and sizes."

However, foot rigidity was a common finding, with R4 highlighting that " … when you're working in ulcer clinics … probably 90% of the feet are rigid."

Several participants discussed clinical pathologies they considered co-existing with LJM, namely, deformity, neuropathy and aging. Participants agreed that defining foot deformity was subjective and problematic.

## Theme 3 — This is the real world

This theme represents a consensus how participants regarded their role in meeting the demands of a diabetes service. Participants understood the risk of LJM and it's potential contribution to DFU. However, all participants agreed LJM was not a priority in the assessment of the diabetic foot. Individual participants were very frank and open about not looking for LJM in clinical practice, for example, " … you could live with limited joint mobility and have no problems" (R5) and "we're not looking for that limited joint mobility and prevention" (R4).

This theme also reflects the challenge of combining complex clinical decision making and striving to align with clinical guidelines. Participants emphasised that time spent in diabetes clinical practice was resoundingly managing wound care issues. R3 explained the sacrifice of current service provision meant that managing LJM should be directed to musculoskeletal (MSK) specialist team members not within diabetes service provision: "We are in a diabetes podiatry world all very focused on the wound and it's sometimes getting that MSK person there."

## Theme 4 — We need a recipe book

This theme related to a desire for LJM research and guidance with a meaningful clinical application.

**Table 4. Analysis in IPA information derived from Smith et al (2012).**

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|---|
| Step 1: read and re read |
| Step 2: Initial noting |
| Step 3: Develop emergent theme |
| Step 4: Searching for connections between emergent themes |
| Step 5: Moving to the next case |
| Step 6: Looking for cross case patterns |

**Table 5. The final themes from the focus group.**

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|---|
| 1. Fallen off the radar |
| 2. Pass the LJM glasses please |
| 3. This is the real word |
| 4. We need a recipe book |
| 5. The awakening |

The participants knowledge in assessing for LJM was partly driven by experience, time pressures and constraints of service provision. There was a recognition their knowledge of LJM was not applied to their practice. One participant expressed the need for a solution: "We want a simple test that's maybe looking at, maybe a couple of joints that might just give us that highlight to limited joint mobility, a quick solution on how to assess limited joint mobility in the foot" (R4). Participants agreed with this suggestion.

## Theme 5 — The awakening

This theme recognises the participants' awareness of their professional culture, the limitations of working in a specialist and professional 'silo' with the issues of role boundaries. They discussed how service design had fragmented podiatry practice into diabetes and MSK 'silos'. The participants questioned whether design of services was detrimental from a professional development perspective. They also requested more education on LJM, in order to develop current knowledge and more research to improve awareness and engagement in clinical practice. As R9 reveals: " … because we've become focused on wound care, we sort of forget bits we've learned."

## Discussion

This study offers a timely opportunity to consider how LJM features in clinical assessment of the foot in diabetes care. The themes emerging from this study present an important and unique contribution to understanding the views of some podiatrists on LJM charactersitics within the context of their own clinical practice.

The theme "pass the LJM glasses please", suggests participants had difficulty identifying the characteristic changes associated with LJM. LJM was discussed in association with tissue, functional and structural changes, mirroring research evidence, but also the diverse views and lack of definition in the literature on LJM. This suggests participants' knowledge of LJM is consistent with the literature, but did not translate into adoption of assessment for LJM in clinical practice as suggested by IWGDF.

Lack of LJM assessment in practice may be explained by factors identified through several themes. Recommendations in NICE clinical guidelines mattered in the lifeworld of participants, evidenced by comments in "this is the real world" theme "if you've got somebody at an increased risk, you should see them every six months" (R8). Despite guidelines influencing practice in the lifeworld of these participants, they recognised the limitations of guidelines, for example when assessing foot deformity "each of us has interpreted that one guideline very differently" (R5).

Indeed, this theme reveals a constraint by these participants in clinical decision making if practice is driven by guidelines. However, this constraint may reflect the limitation of patient contact time when undertaking assessments, with diabetes footcare provision focused on managing wounds at the sacrifice of other assessments. There is no recommendation to assess for LJM in UK NICE guidelines (NICE, 2016). The theme "we need a recipe book" would indicate these participants lacked confidence to assess LJM independent of external guidelines illustrated by R4 "we want a simple test that's maybe looking at maybe a couple of joints that might just give us that highlight to limited joint mobility" (R4).

The absence of LJM as a risk factor for DFU in UK clinical guidelines may be the most significant influencing factor for these participants. LJM was not prioritised by these participants and might explain the perception that LJM has "fallen off the radar". This is important since the IWGF suggests the need for assessing loss of joint mobility and conflicting views between guidelines that shape professional practice perhaps justifies efforts to resolve the disparity. Lack of explicit recommendations in UK guidelines may be a barrier to practitioners developing or adopting a method for assessing for LJM in practice.

The participants articulated a strong influencer of professional practice was the pressures of time, with service provision being invested in current wound management and not prevention. As R4 revealed: " … you're not necessarily doing anything preventative, which perhaps we might've done at one time." This perception of not having time to do anything preventative may explain why LJM has fallen off the radar.

The findings from this study suggest there is a case for developing identification of the characteristics and hence a clear definition of LJM, through integrating research and clinical experience in assessing LJM. This would help practitioners develop skills to identify and manage LJM and its potential to contribute to risk of DFU. However, having the time and freedom to develop new skills may not be consistent with guidelines driven practices and further work might be needed to help resolve tensions between factors affecting professional practice.

## Study limitations

The primary limitation of this study was a purposive sampling of participants from a specific geographical area. This may not be a representative of a wider population of podiatrists working in diabetes care. That said, this study has achieved its aim of exploring some podiatrists' opinions on the characteristics of LJM as defined in current professional practice. This work has the potential to inform future research on LJM in professional practice and if it would make a difference in preventing foot ulceration.

## Conclusion

Despite research indicating loss of joint mobility is important for assessment of the diabetic foot, the

participants in this study suggest it may be lost from routine practice.

This may be due to a lack of standardised test for it, in addition to unclear prognostic implications from the literature, and the subjective nature of detecting it. Until there is greater clarity and agreement on how to quanitfy LJM in the context of identifiable foot characterisitics, it is unlikely to be included in the diabetic foot screening processes. Indeed, since most screening is performed by non-podiatrists the uncertainty around detection of LJM creates a difficulty for application in clinical practice.

Therefore, for these participants the reasons for LJM being off the radar were multifactoral, however, a dominant factor appeared to be that LJM does not appear in UK clinical guidelines and these podiatrists are operating in a guidelines driven service. ■


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