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'It's like being in a tunnel': Understanding the patient journey from tooth loss to life with removable dentures

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ABSTRACT

Introduction: The aim of this study was to conceptualise the key stages of the patient journey in the provision of a new denture and examine the factors leading to successful patient-related outcomes.
Methods: Two partially dentate patient samples were included: (i) Denture wearers - patients who had a denture fitted within the previous five years and (ii) New dentures - patients receiving treatment for a new or replacement denture. The methods involved direct targeted participant observations of the denture fitting process, debriefing interviews and a follow-up focus group exploring the patient journey. Data were analysed through the use of phenomenology and grounded theory.
Results: Interviews were completed with twenty participants of the denture-wearing sample (11 males and nine females, age range 22 to 86 years). Thirteen participants were included in the treatment journey sample in two primary care settings (six males and seven females, age range 55 to 101 years). Tooth loss and recovery was described as being in an 'emotional tunnel' resulting from 'bodyphonic processes' associated with tooth loss. 'Bodyphonia' subsequently became the context for 'taking control' and 'managing disclosure' when living with a removable denture. Different courses through this process can be readily observed, moderated by different variables (i.e., previous experience, working knowledge, a good fit, the treatment alliance, negotiated compromises and bounded responsibility).
Conclusions: An'integrating framework' that seeks to describe the patient journey from the experience of tooth loss to recovery with a denture is proposed. This framework could be used to aid development of a clinical pathway to guide treatment options.
Clinical Significance: This paper conceptualises the patient journey. It stresses the importance of understanding the stages patients go through and highlights that for the dental team, the try-in stage is perhaps the best stage to give information about the denture and plans for continued care.

1. Introduction

The 'dental transition' has led to increasing proportions of society living longer with more intact natural teeth [1]. Improvements in oral health have facilitated this change with a shift towards a more preventive paradigm and value placed on retaining teeth for longer [2–4]. Consequently, there has been a dramatic shift in the populations of high- and middle-income countries (HMICs) from edentulism (loss of all teeth and replacement with complete dentures) to retention of total or partial dentitions throughout life. Oral health has become a 'life course project' with people increasingly valuing retention of their teeth (in whatever form) into older age [4]. Despite these gains, the 'dental transition' has had a range of paradoxical effects on the oral health status of populations worldwide. There is always some decline in oral function as people age, with over 60 % of older adults affected by periodontal disease, only 40 % with a functional dentition (having ≥21 teeth) and over one-third having dry mouth or xerostomia (associated with polypharmacy) [5,6]. These problems can significantly impact masticatory

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function, smiling, speaking and nutritional intake, dramatically affecting health and well-being. In summary, absolute oral health (measured by tooth retention) has improved, but oral function shows marked differences between individuals and groups.

An important feature of the 'dental transition' is that more and more people are living partially dentate, with increasing numbers having some form of restoration, including crowns, bridges, implants and dentures. A recent cross-sectional study in Canada identified that 37 % of the sample had fewer than 21 teeth, with 7 % being completely edentulous. Significant incidences of both stability (Maxillary: 32 %; Mandible: 44 %) and retention (Maxillary: 18 %; Mandible: 41 %) were reported for the denture prostheses from this partially dentate sample [7]. These denture security problems directly affect their use, with between 30 and 50 % of patients with partial dentures not using them. There are also significant discrepancies between clinician expectations and patient experiences of the relative success of dentures, with many patients reporting not feeling prepared for living with a denture [2,8,9].

Evidence in relation to the social and emotional impacts of tooth loss presents a complex picture. In some studies, tooth loss has been shown to have significant emotional and personal impacts on the sense of self-worth, appearance and confidence [10–14]. Extractions are often seen as the only definitive solution to oral pain. In rural communities, tooth loss has sometimes been shown to have little stigma attached [13,15]. In other countries (Brazil, Ireland, New Zealand, the USA and India), tooth loss and recovery with dentures has been reported as one way to avoid the perceived significant future costs associated with ongoing dental work [2,13,15,16,17,18]. The reasons for this can be complex; in New Zealand, a natural dentition was preferred during the middle part of the 20th Century. However, this preference could quickly give way in the face of significant dental disease, poor aesthetics and concerns that future problems would escalate [17]. Eventually the 'status passage' into complete tooth loss was to become largely discredited [18]. The result is that there are complex and widely varying experiences of tooth loss and denture provision. Removable dentures have sometimes been seen as a 'gift' by those without dental care [15]. Patients in the USA reported that replacing teeth with dentures was sometimes the only compromise in achieving 'acceptable' levels of chewing ability, speech and aesthetics [16].

Qualitative data show that some patients try to adapt to their new dentures [19,20]. However, many patients are not prepared to live with removable dentures and express shock at the challenge of adapting [15, 20,21]. Such patients are deeply impacted by tooth loss and find it difficult to accept they have a denture [19]. Considerable 'stigma' exists when people experience themselves as 'deviant' from changing social and cultural norms of 'high-end' dentistry [22]. High-end treatments (implants, implant retained dentures, cobalt chrome dentures) remain unobtainable for many worldwide. Removable dentures are often the only viable treatment option; yet relatively little is known about the pathway to their successful use.

Evidence demonstrates interactions between denture type (full, partial, upper or lower) and patient-related variables (age, gender and socioeconomic status), but little is known about these interactions [8]. Dentures for the replacement of anterior teeth have been associated with being worn more frequently, although the use of these types of dentures is mixed [8]. The rationale for this is not examined in detail in the literature, but these variations reveal important underlying factors related to the success of removable denture provision. Indeed, when coupled with denture-related problems (damage to retaining teeth and supporting tissues, potentially root caries), there has been increasing support for the shortened dental arch concept [8,23-25] and recommendations to not provide RPDs in some cases. There is therefore a pressing need to understand the patient-related dynamics underpinning the journey into successful removable denture use, the aims of this study were twofold:

1. To examine the patient journey towards the provision of a new removable partial denture; and
2. To conceptualise the key stages of the patient journey and to examine the factors related to successful outcomes.

2. Methods

This multi-method qualitative study drew on narrative interviews, targeted participant observation and a focus group. The research approach combined grounded theory methods informed by phenomenology [26,27]. The interdisciplinary research team comprised clinical academic dentists, social scientists (psychology, geography and sociology) and those working in the dental industry. Narrative data were collected from adults from across the United Kingdom. Targeted participant observations were collected from a primary care dental setting in northern England and undergraduate clinics in a teaching dental hospital. The clinical settings were mixed, one setting was a primary care setting with experienced practitioners and the other was a teaching setting where novice practitioners were being trained. The latter setting enabled novice practitioners to provide more detailed accounts of the methods and techniques behind treatment provision. Efforts were made to include those from ethnic minority backgrounds and to balance the sample by gender and socio-economic status. Ethical approval was granted by the University of Sheffield's research ethics committee (application 043367) and NHS ethical approval was received for the recruitment of patients in the dental hospital and primary dental care settings (IRAS Project ID: 312493).

Participants were approached through the institution's staff volunteer email lists, the dental hospital patient lists and the primary care dental setting in conjunction with advertisements on websites, forums and social media. All adults who had the capacity to consent, had teeth extracted and a denture fitted in the last five years were eligible to take part in the narrative interviews (Aim 1.). All adults who had capacity to consent and were having dentures fitted were eligible to take part in the targeted participant observations (Aim 2). Children and adults who did not have the capacity to consent, along with those who would require an interpreter (for funding reasons) were excluded from the study.

After the initial approach selected participants were emailed or posted copies of the project information sheet and consent form to read. They were given time to read these and consider their participation in the study. Participants were contacted and an interview arranged at a time and place that suited them. Written consent was obtained on the day of the interview if conducted in person, or the form was emailed or posted to a research team member if the interview was conducted over the phone. Participants were given a small honorarium (£20 voucher) after the interview.

2.1. Analytic approach

Grounded theory is based on a method of constant comparative analysis; this involves comparison of diverse cases to generate concepts that explain how the social world varies and is organised [26]. A key aspect of this study is that the type of denture has important consequences for the subsequent journey (Aim 2.). Thus, some participants with cobalt chrome dentures and two with complete dentures were included. We also found that patients often embarked on a 'denture career' that could progress from acrylic dentures to cobalt chrome dentures, or in the other direction. It was necessary to capture this complexity in the study.

Narrative interviews were used to elicit the experiences of the participants [29]. Interviews started by asking participants to describe the story of their denture, before moving on to the history of the denture, their experience of tooth loss (pre-extraction, post-extraction, before and after denture fitting) and any changes they had experienced. The main themes that were investigated were:

- Personal history, experiences and knowledge
  - Initial reactions
  - Illness career
  - Lay beliefs
  - Pre-extraction, post-extraction, denture fitting, post denture fitting.
- Impacts on everyday life
  - Activities and participation
  - Adaptation and coping
  - Emotional responses
- Links between experiences and identity

Interviews were designed to be open and flexible whilst switching between topics and questions. Transcripts and recordings were stored in the research institution's secure cloud storage, with transcripts being anonymised as part of this process.

As the narrative interviews progressed a sample of patients due to have a denture fitted were recruited for the targeted participant observations (Aim 2.). This part of the study aimed to examine the work of the dentist and patient in the clinic to investigate how living with a denture was accomplished in everyday life, with a range of experiences sought (of those having their first denture fitted compared to those who had a second or third denture). Observations were recorded in a diary. Finally, three months after the targeted participant observations, debriefing interviews were conducted with all patients and dentists. Eight participants were invited to attend a final focus group to share their experiences with each other about their journey.

2.2. Data analysis

The data were derived from a phenomenological analysis informed by grounded theory methods [24,30]. These approaches are combined because they complement each other. Phenomenology enabled researchers to focus on the lived and embodied experience of having a denture fitted, while grounded theory was used to conceptualise key stages of the pathway being investigated. Coding was conducted using NVIVO (Version 1.7.1) [31]. In this study, the unit of analysis is the patients' journey, which is comprised of the beginning, middle, and end. Data are presented through observations and information from the debriefing interviews (Aim 2.), triangulated with material taken from the narrative interviews (Aim 1.) and the focus group. This reflects our approach to discover 'what is going on' in the journey to adaptation with removable dentures [33].

3. Results

Twenty-two participants were recruited for the narrative interviews, with two interviews excluded because of their poor quality and lack of content. Of the twenty participants, four had cobalt chrome dentures, and sixteen had acrylic dentures. Seventeen participants who consented to the targeted participant observations were approached, with two subsequently withdrawing, leaving fifteen participants and observational data from thirteen participants. Participant details for the narrative interviews are summarised in Table 1.

The sample for the narrative interviews was demographically very broad. Age ranged from 22 to 86 years old, 11 males and nine females. There was also a broad range of occupations.

Table 2 shows the participant details, clinical factors and patient-related outcomes for the participant observations. The sample was comprised of adults aged 50 to 101 years old and included seven males and seven females. The sample differed from the narrative interviews with participants being older and predominately working class. Reflecting the demographics of the immediate area around the primary dental care clinic where much of the sample was recruited.

A summary of the outcomes for participants' journeys is also presented in Table 2. Of the fourteen patients who completed treatment, five had very successful outcomes. A successful outcome meant the participant used the denture with minimal disruption to their daily lives. Seven patients were defined as having a 'solution achieved'. This refers to outcomes involving various compromises, for example, using adhesives or understanding which contexts to wear the denture and when to remove it. Two participants were no longer using their dentures. In each case, the denture was transitional and reflected the temporary nature of the treatment. Table 2 demonstrates the technical challenge of the denture was not necessarily a good indicator of the outcome. In contrast, the participant's experience concerning wearing dentures was extremely important for outcomes. How well the dentist and participant knew each other was reflected in the degree to which there was a strong 'treatment alliance'. Table 2 also reflects the highly variable process associated with changing expectations during treatment. The rest of this paper seeks to discuss the key aspects of the patient's journey and key factors influencing that journey. Much of the journey into living with a denture is influenced by the emotional impact of tooth loss and coming to terms with the new denture. Patients conceptualised the overall journey to take place through four phases: Tooth Loss, The Emotional Tunnel, Prosthetic Hope, and Prosthetic Compromise leading to managing disclosure (See Fig. 1).

Table 1
Participants Involved in the Narrative Interviews.

Participant number and name	Age	Sex	Occupation
Participant 1 - Keith	46	Male	Warehouse Manager
Participant 2 – Betty	44	Female	Disability Support Advisor
Participant 3 – Penny	61	Female	Nurse (retired)
Participant 4 - Bill	52	Male	Car Mechanic
Participant 5 - Emma	46	Female	Care Home Assistant
Participant 6 - Florence	24	Female	University Student
Participant 7 - Rose	26	Female	Nurse
Participant 8 - Lyana	22	Female	University Student
Participant 9 - Venus	71	Female	School Teacher (Retired)
Participant 10 - Shay	64	Female	Manager (retired)
Participant 11 - Ben	75	Male	Gardener (retired)
Participant 12 - Paul	64	Male	College Lecturer (retired)
Participant 13 - Alex	86	Male	Metal Caster (retired)
Participant 14 - Carrie	71	Female	Receptionist (retired)
Participant 15 - Michael	71	Male	Mental Health Nurse (retired)
Participant 16 - James	73	Male	Youth Worker (retired)
Participant 17 - Bobby	66	Male	Engineer
Participant 18 - Mark	69	Male	Engineer (retired)
Participant 19 - Stephen	75	Male	Teacher (retired)
Participant 20 - Roger	71	Male	Builder

3.1. Tooth loss

The journey into tooth loss varies markedly. It can be abrupt or protracted, with both scenarios being managed in widely varying ways. Different groups can invest varying levels of money, time and energy into oral care over the life course. They therefore hold nuanced and differing positions on oral care as a life course project [4]. Some patients experienced a managed decline. Penny and Keith talked about having lots of work done and described their experiences of this work 'gradually deteriorating' until there were suddenly problems. Both had good ongoing relationships with their dentists and took varying levels of responsibility for their oral health declining.

> *So, I had all these crowns done, all my top my visible teeth, because my lip line, if you can see, you can't see my bottom teeth and they lasted for a good while. But, of course, as I got older, they needed replacing and this went on and on and then in 2018 suddenly a front one snapped off and then another. Then I went to my dentist – this is in Scotland – who said, "Really, we need to take another one out to make this partial denture usable." (Penny, Female, 61)*

> *There's nothing better than looking after your teeth, is there, [removed]? That's the message I sort of convey to my kids, or anybody who doesn't*

Table 2
Summary of participants and outcomes targeted participant observation.

Participant number and name	Age	Sex	Occupation	Challenging denture to make	Experienced Denture Wearer?	Strong Treatment Alliance	Denture Type	Individual expectations met or changed?	Outcome[i]
Jenny	55	Female	Registered Disabled	Yes	Yes	Yes	RPD	Met	V Successful
Jim	55	Male	Building Manager	No	No	Eventually!	RPD	Changed	Solution achieved
Karen	64	Female	Retired Childminder	Yes	Yes	Yes	RPD	Met	Solution achieved
Lisa	72	Female	Retired Teacher	Yes	Yes	Yes	Cobalt Chrome	Met	Solution achieved
Alicia	101	Female	Housewife	Yes	Yes	No	Full	Changed	Solution achieved
Danny	75	Male	Council Worker	Yes	Yes	No	Full	Met	V Successful
Geoff	50	Male	Unemployed	Yes	No	No	RPD Transitional	Not Met	Not using
Tareq	60	Male	Landlord	No	No	Yes	RPD Transitional	Not Met	Not using
Fami	64	Female	Disabled	Yes	Yes	Yes	RPD	Met	Solution achieved
Annette	68	Female	Teacher Retired	No	Yes	Yes	RPD	Partially Met	Solution achieved
Harry	83	Male	Builder	Yes	Yes	Yes	Cobalt Chrome	Met	V Successful
Kenneth	62	Male	Disabled	Yes	No	No	Cobalt Chrome & RPD	Met	V Successful
Rob	56	Male	Courier, Carer	Yes	No	No	Cobalt Chrome	Partially met	V Successful
Jane	68	Female	Retired Factory Operative	Yes	Yes	No	RPD	Partially met	Solution achieved

[i] Rated by clinican, researcher and patient.

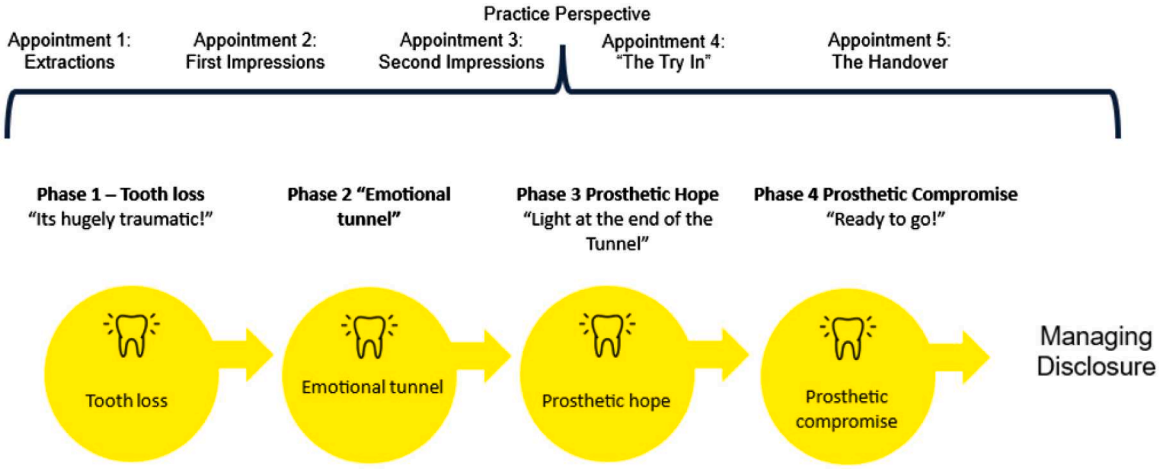

Fig. 1. The patients journey into tooth loss and managing disclosure.

brush their teeth, really, for me. If you don't maintain, look after them properly, this is the sort of, you know, journey you can go down." (Keith, Male, 46)

In contrast, some patients described experiencing tooth loss very abruptly. Geoff had recently had teeth extracted, and required a denture. He was quiet and did not react much to the dentist's questions, making it very difficult to gauge if there was discomfort in certain parts of the denture. He seemed distracted and unaware of what was happening and what was to come. During the follow up interview, Geoff indicated that he had been having problems with 'gum boils' a year previously, when it was explained that he would need these teeth extracted. After this appointment, he explored experiences of dentures with people he knew. At the time, he did not agree to the extractions because he was "committing to something" and "didn't know what was happening" with some of his other teeth. He did not trust his dentist and approached the process with suspicion:

":…some of the disadvantages of having false teeth and that, you don't get to hear any of them. I've found out bits from people that have got them like, oh, your food doesn't taste the same and sometimes you have to put more… if you put sauce and stuff on your food, you'll be putting more sauce on because you can't taste it the same way. Certain people say, 'Oh, I take mine out when I have something to eat,' (Laughs)…. None of that, really, they ever explained, I don't think, the dentist. Really, by the time you speak to the dentist about having false teeth, it's because you need them (Laughs) rather than what you should have done to avoid having them, kind of thing." (Geoff, Male, 50)

Rose lost teeth because of a traffic accident, but had an ongoing positive relationship with a dentist:

I had a perfect set of teeth until six years ago when I was involved in a motorbike accident, when I was on my way home from school. And all I can remember was a car bumped into my bike from behind and actually I really fell off onto the floor. …on recovering I discovered that I had lost

my set of teeth, that is on the upper part of my mouth." (Rose, Female, 26)

She then stated:

Yeah, it [relationship with dentist] was really helpful because I thought that my life had come to an end, because I had lost, really, I'd lost 10 pairs of my upper and lower teeth." (Rose, Female, 26)

Tooth loss, therefore, carried with it a degree of personal trauma and frequently resulted in significant emotional impact, as Emma alluded to:

It's quite a far distance for me to get there, it's two buses. But it's the only option I had because the embarrassment… So I have to joke about it because I felt humiliated because I couldn't, yet again, couldn't afford time off work. I had to go to work with no dentures in." (Emma, Female, 46)

She went on to talk about how her tooth loss impacted her work through her speech:

My job, I work with dementia, so they loved me no matter what, bless them, when I walked in with no teeth. But when you're seeing a GP and seeing district nurses come in and you're having to be professional, which I can be professional, but I felt stupid. So I very much, even though I had a mask on, I very much have to identify, pulling the mask down to show them I've got no teeth because I felt as though I sounded drunk when I was at work. Does that sound silly? But that's how I felt." (Emma, Female, 46)

It took Bill eight years to find a dentist with enough empathy to build a good enough working relationship to have his teeth replaced with a denture:

It's more of like if I catch a reflection of myself or I'm talking to somebody and I can sort of notice and they're sort of looking at it or looking at my teeth, I've felt remembering that it's there." (Bill, Male, 52)

The loss of teeth was deeply 'discrediting,' an emotional experience leading to significant personal trauma. The trauma started at the first appointment and spilled over into appointments three and four. This phase is therefore labelled 'the emotional tunnel'.

3.2. 'The emotional tunnel'

A key consequence of the emotional impact of tooth loss was reported impairment in participants' capabilities to engage with the denture fitting process. Participants reported not feeling able to hear or completely understand what the dental team was saying to them. Geoff felt very unprepared for life with his teeth removed and barely communicated throughout his treatment. Rose talked about her trauma and the difficulties in understanding what the dental team was telling her.

"I was kind of traumatised at the moment and I could not understand what the doctors and the dentists were telling me. But yeah, but I visited a psychologist and together with my dentist I was able to be informed of the entire process." (Rose, Female, 26)

The emotional tunnel is characterised by relatively light or heavy 'bodyphonia'. Defined here - when bodily conditions (tooth loss, broken fillings) combine with symptoms of sensitivity, pain, emotions (shame, anger, sadness, hope, fear) and meaning (aging, implications for the future). How this aspect of the patient's experience is managed has consequences for how new dentures will be used in daily life.

Contrasting with trajectories laden with significant manifest emotional impact, are the 'emotionally light' trajectories of those returning for their third or fourth denture. Repeated cycles of having a denture fitted helped participants develop significant 'know-how' and confidence and trust in the dentist, which was at the centre of successful treatment. Trust can only be developed when the dental team demonstrates care and support, gives enough time, helps patients relax, puts them at ease without rushing and takes time to explain what is happening. Patients discussed the importance of good relationships between themselves, their dentist, the dental nurse, family and friends. They were able to form a 'treatment alliance' with the dental team (dentist, nurse and reception team) and many negative aspects of the emotional tunnel could therefore be overcome. The following exchange between two experienced denture wearers illustrates this:

Harry "The more confidence I have in a dentist the less emotional I get."

Jenny "Yes, that's right. I used to cry and faint."

Danny "Did you?"

Jenny "Yes I used to be in a right state. This dentist, he right good!"

(Harry, Jenny, Danny – Focus group)

The emotional tunnel frequently ended at the 'try in' stage when the patient finally got to experience what the new denture would look and feel like and started to develop 'prosthetic hope.'

3.3. Prosthetic hope or 'Light at the end of the tunnel'

When participants described 'light at the end of the tunnel', they referenced the point at which their new denture became a 'reality' for them, making the 'try in' stage a key 'touch point'. Until then, participants described the process as being something 'you had to get through', which was characterised by 'gagging', discomfort and having debris in their mouths. Kenneth had four appointments before getting to the 'try-in' stage. Until then he had been relatively passive, having work done on his mouth over numerous visits.

This was the 'try in' stage for Kenneth's first denture. Kenneth came into the clinic with a big smile on his face and sat down. He was looking keenly at the models of his teeth as well as the location of the denture. This was his first try in stage and it will be the first time that he has had something in his mouth approximating to a denture.

"Wow this is amazing, look at them!"

He was clearly very excited to see the wax models that he would be trying in his mouth. Megan laid him back in the seat and fitted the top denture model into his mouth.

"It's going to be a bit loose because it's wax and not acrylic."

She then inserted the bottom denture, she did seem to be quite careful but eventually, the denture seated nicely into place.

"Look in the mirror, are you happy with the shape and the colour?"

"Hey! It's good init!" Kenneth smiled broadly looking at it in the mirror."

The nurse then carefully spoke to Kenneth asking him "can you bite together?" At this point Kenneth had bite and it seemed to feel comfortable. He seemed very excited about the whole process.

This is a complex passage involving a detailed interaction around the fitting of Kenneth's new denture. He was very excited when he first saw the wax models. Adjustments were being made to the model as Megan observed its performance as part of Kenneth's speaking, bite and smile. They tested his pronunciation of words looking carefully at the fit of the model. Additionally, Megan assessed how far back the denture would go in relation to the palate. There is a balancing act between making the denture too big and therefore uncomfortable, or too small and lacking stability. Kenneth was engaging with the denture as a new object that had the potential to change his everyday life. This was very common in the data and emotions were a prominent feature of all clinical interactions. This is an unanticipated but extremely important finding. Participants talked about how their experience with the wax models led to anticipation of a future with their dentures - they felt 'excited' and that all 'this' was 'near the end' (Harry). As Jenny said in the focus group

"You are hopeful that it's all going to come to an end." (Jenny, Female, 55)

Participants went on to discuss the excitement they felt in anticipating the future. The 'try in' phase was an emotional experience characterised by hope, excitement and happiness. There was also desire and an anticipation for the future and what their denture might achieve. They described the final phase as being 'ready to go'.

3.4. Prosthetic compromise: 'Ready to go!'

Participants talked about the final stages of their appointments and being 'ready to go', where the denture was 'handed over' to them so they can 'get on with it'. At this stage, the unstable status of removable dentures, as a reality permeating everyday life enters sharp focus. The denture, no matter how well-fitting, requires ongoing daily adjustments. It must be actively incorporated into daily life through performances related to cleaning, adjusting what to eat and using adhesives. For some patients, this could be challenging.

Jim had already had extensive previous dental work (crowns, bridges and root canals) done privately, but this all failed during the COVID-19 lockdown and had to be removed. He had seen a private dentist who had dismantled all the previous work and discovered that there was an infected tooth (to which the bridge work had been attached) that had to be removed. Consequently, he now had a large gap at the posterior left side of his mouth. This made chewing very difficult and he worried about his teeth breaking down further. The gap could be filled with a cobalt chrome denture, constructed in the private sector but this would have been at a significant financial cost. An alternative was to have implants provided, again in the private sector, which would have been even more expensive. The dentist suggested that because of the risk of further tooth loss, an acrylic partial denture would be the most reasonable option. Jim opted for the partial denture. The treatment ran smoothly and eventually, he was fitted with his new denture but in the fitting stage he realised that this was going to need managing. He left the clinic and at three months follow-up was no longer using his denture. He said:

Last time you saw me, I think it was when I had the denture fitted. I went back a couple of times because it was rubbing and making my gum sore in a couple of places. We eventually got that remedied and I was able to wear the denture without too much pain. Unfortunately, or because I didn't persevere with it, I found that I couldn't stop touching it with my tongue and I've been reluctant to wear it very much." (Jim, Male, 65)

Two crucial factors were at play in Jim's case - the movement from fixed prosthesis to removable prosthesis being difficult to accomplish, and his denture being at the back of the mouth and so being less aesthetically important. Adaptation involves facial muscles getting used to the denture, which can take a long time. From our follow-up interview with Jim, it became apparent that he wanted the denture primarily to help with chewing. This reveals a 'hierarchy of functions' associated with each denture, which can change over time. The following excerpt reveals how Jim had searched for the right 'cement'.

"All right, okay. Good man. So I just wanted to see… how have things been going with you, Jim, then?"

"So using the adhesive, things have been a lot better. I can leave the denture in. I can even eat with it no issue whatsoever.

"Brilliant."

"The only issue was, I had to try a couple different adhesives before I found one that got on with. One was a bit stickier and nasty."

The adaptation process took 12 weeks for Jim. It was only after we accidentally said in our previous interview that sometimes people use adhesives that he decided to try some. This case is useful because it demonstrates how patients can be on a prolonged journey involving significant effort in achieving solutions they eventually settle on. The solutions themselves involved different combinations of materials, situations and performances. Some wore their dentures all the time and had very successful outcomes, others wore them partially, taking them out when they were in private spaces. Lisa talked about how her new cobalt chrome denture was initially quite 'sharp' and needed adjustment.

"I've been back and he's done something and it has made it better. Then it's still not right, so I've gone back again, but at the moment, until today… yesterday, I did a day's work, which I'm retired, obviously, but I went back and did a day's work in school and I didn't notice it all day at all, until I turned left, round the corner. Then I did and I think that's psychological. (Laughter) So, l took them out before I ate dinner last night.

"Right, so you would take it out so that you weren't eating."

"Yeah, it's difficult to chew. I can chew on this side, no trouble, on the left-hand side, but not on the right-hand side. It starts to feel sore." (Lisa, Female, 72)

This interview took place three months after the initial denture fitting. Lisa told us that she was happy with the denture as it was. She would wear it in public with friends and remove it at night before dinner. She was quite happy that, despite imperfections, it did what she needed it to do which was help hide the disclosure that she had lost teeth.

"..you know, it doesn't bother me, really. I'm aware of it. I'm not in any pain and I can still eat. I'm fine, really. I'm fine with it, okay. … there are bigger things to bother me."

"Yeah?"

"I think it's about personality, maybe, whether you're prepared to put up with things and manage things and try again…… So, there are things. There are other things, rather than lack of teeth and the denture, that are more important in my life." (Lisa, Female, 72)

Participants could easily adapt which side they could chew on. They used adhesives and took their dentures out to eat at night. This again provided evidence that each individual has a prioritised 'hierarchy of functions', and if achieved, they were relatively happy with the denture and the resulting compromises. While Jim's priority function was chewing, he also did not wish to disclose that he had lost teeth, and Lisa's key function was to mask the loss of teeth. Therefore, the key outcome of treatment for many participants in this study was 'managing disclosure'.

3.5. Outcome: managing disclosure

The overall goal of treatment with removable dentures is to manage the disclosure of having experienced tooth loss. A key reason for having a denture is to avoid the negative social and psychological consequences of revealing this information. All participants reported telling only loved ones or close friends and family about their dentures and would avoid discussing this with others. Participants reported sensing judgments about losing teeth, for example, being negligent. This relates to personal 'stigmas' associated with tooth loss. A denture is also a stigmatising object.

"It's just a bit of an embarrassment. There's a stigma, isn't there. I don't care what anybody says, there's a stigma, there's a stigma attached." (Emma, Female, 46)

"You know, it takes a lot to embarrass me, I'm not embarrassed by anything, am I? As I've already said, you know, I've been there, seen it all, done it, got the T-shirt and all these other clichés. Now, this embarrasses me. I'm just deeply embarrassed by it. I'm embarrassed by how it looks or anybody knowing about it." (Penny, Female, 62)

Each statement demonstrates that being perceived to have a denture

is particularly problematic for these participants and 'managing disclosure' is an important imperative for each of them.

As we shall see this embarrassment was situational. The way disclosure is managed is highly individualised and unpredictable. Carrie and James kept their denture a closely guarded secret:

> *"…it was embarrassing as well and I find that still the same at the moment. In fact, none of my family actually know I have got a denture. That's how embarrassing it is for me." (Carrie, Female, 71)*

> *"No, they don't know about it; no, I must admit, apart from… and the kids don't know about it because (laughs)… no, no, my son and daughter, they know, but the grandkids, I don't think they know, because the other granddad, he's had all his teeth out and he's had them out for years and years. It's quite a big thing; he takes his teeth out and stuff. I haven't got to that stage yet. I'm not that confident yet to do that." (James, Male, 73)*

How participants told others was an important part of managing the denture in daily life. Paul and Keith, both found it helpful sharing with others.

> *"When I told them the story about what the dentist said to me, which teeth is it and I said the ones in my pocket, they thought it was hilarious. That was accepted amongst us given we were all of the same ilk, we were all in this thing together, the camaraderie effect." (Paul, Male, 64)*

> *"And I remember being sort of like, "Oh, I'm going to have a denture; a false tooth." And I did sort of feel like that; there was like a stigma attached to it. But actually, well, my good friend [removed], he's had a denture, a partial denture, for years and we went to boxing gym together. And [removed] always liked to pull it out. It's a party trick, you know. He loves it. (Laughter)." (Keith, Male, 46)"*

Managing disclosure is therefore a constant 'self-conscious' process that has an impact on multiple facets of everyday life. Threats to disclosing the denture in the patient's mouth were negatively regarded, such as if the denture was loose, poorly fitting, or painful - this was conceptualised as 'threatening disclosure'. But if the denture fitted well and was comfortable it was viewed as an extremely positive achievement.

Participant observations demonstrated that negative psychological impacts occurred whenever an existing denture started to slip or move due to changes in the shape of someone's mouth. Jenny discussed how her denture started to slip because her gums had 'shrunk'. This primarily happened when she was speaking, but also when biting into sandwiches and foods that needed to be 'ripped off'. Bread would also stick to the top of the denture and the denture would fall continuously. This resulted in other people noticing, having a huge impact on her psychologically. She described how much this poorly fitting denture was impacting her life:

> *"…the palate had started moving, the previous one, quite a while ago, really and I just put up with it. …it just got so that it was unbearable not being able to smile properly, talk properly, kiss properly, eat properly. So, it was a while, yes. It was getting that self-confidence up to go back to the dentist to have it sorted." (Jenny, Female, 55)*

Jenny stopped going out, felt she could not be intimate with her partner and lost a lot of 'self-confidence'. The psychological impact of having a denture can be immensely positive, but when there are problems with the fit, the resulting impacts can be quite negative. Dentures are associated with aging and carry a stigma and an associated shame. This is why managing disclosure is so important. In this context, participants reported regretting having teeth removed.

4. Discussion

This study aimed to examine the patient journey towards the provision of a new denture, conceptualise the key stages of this journey and to examine key variables related to successful outcomes (Fig. 1). The patient journey is conceptualised by patients primarily through emotional processes they experience. It involves the reverberating emotional impact of tooth loss, the emotional tunnel, prosthetic hope and eventually, a kind of 'prosthetic compromise'. The overall process of fitting dentures and living with them is conceptualised as 'managing disclosure,' involving the patient and dentist 'masking' [32] the presence of tooth loss. Patients closely guard whom they inform about their tooth loss and dentures. This corresponds with the concept of 'prosthetic privacy' established in the clinical literature [35]. All patients in this study negatively received threats of uncontrolled disclosure. When disclosure and 'prosthetic privacy' were threatened through the loosening of the denture, most participants reported returning to have a new one fitted. Participants reported withdrawing from public social situations when this privacy was threatened.

That participants reported withdrawing from public life as a result of their prosthetic privacy being threatened demonstrates the continued disabling consequences of how the mouth is to be managed in public spaces [34]. As Owens and colleagues noted [34] concerning dry mouth, "the dominant mode of mouth maintenance is through individualised mechanisms" (p.11). Here, we see similar impacts associated with being forced to manage one's oral health alone in a public space. We show that living with a removable denture can be a hidden disability with significant consequences - many of our participants suffered from social isolation, loss of work and being restricted to living at home. There is more room to develop a much greater awareness of the disabling effects of oral conditions and how these intersect with public spaces.

The study also confirms the emotional impact of tooth loss [11,14,35] and the resulting stigma associated with loss of teeth and having a denture [22]. Beyond this, the research demonstrates that the process of fitting a new denture is characterised as a deeply emotional experience. Being aware of this, recognising emotional triggers, and understanding how this affects treatment outcomes are important areas for future research. Freeman [36] was the first to explore the idea of the 'treatment alliance', developed from psychodynamic theory and the work of Szasz [37]. Communication models in dentistry, such as the Communication in Dental Settings Scale (CDSS) [38], which is used to teach current dental students, do not recognise this important dimension. Emphasis tends to be on information 'giving' and 'receiving' alongside action and behaviour. The recently developed 'Verona framework' appears to be the only framework for communication that recognises the importance of emotions in clinical encounters [39]. This variable may be central to a successful 'treatment alliance' and positive dentist-patient relationship.

The paper also highlights the centrality of patients' 'know-how' to successful outcomes. In this respect those going through tooth loss and denture provision for the first time were especially vulnerable. In each instance where we had first-time users, the denture was not used, and participants were unprepared for living with the denture. In one case, the follow-up interview convinced the participant to return to the clinic for more support, and eventually, they could incorporate the denture into everyday life. This indicates the need for more patient-centred pathways and a programme of post-treatment care, perhaps co-designed by patients themselves. It also demonstrates the importance of using lay networks and knowledge [40].

The strengths of this study are that it draws on a range of qualitative methods, enabling a greater degree of 'methodological triangulation' [41]. Narrative interviews enable researchers to get a 'strategic overview' of life with removable dentures, whereas targeted participant observation allowed us to 'zoom in' on the journey itself [42]. These combinations allow the strategic use of different kinds of data to enable researchers to get closer to what is 'going on' [28] in the field. These data seek to illuminate a poorly understood aspect of oral rehabilitation by unpicking the key moments in the journey with a new denture. We can see that this journey is described as an emotional journey characterised by dark tunnels, hopes and compromises. Previous work has uncovered the importance of the emotional impact of tooth loss [2,9,10,14]; here, these emotions play out over time as participants adapt to their new dentures. These data are limited to England, and

consequently, the findings cannot be generalised to the whole population of England or beyond.

5. Conclusion

In conclusion, the 'integrating framework' proposed in this study reveals how the emotional consequences of tooth loss feed into the experience of having a denture fitted. These emotions have an impact on the clinical interaction and indicate how patients interpret the process. Careful management of patient's experiences by the dental team, paying close attention to their emotions and their journey, can enable positive clinical outcomes. This study also suggests that dental teams can help support patients with the hidden disability that results from wearing a denture by showing awareness that a loose or poorly fitting denture can have quite profound consequences for prosthetic privacy.

CRediT authorship contribution statement

Barry John Gibson: Writing – original draft, Validation, Supervision, Software, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Sarah R Baker:** Writing – review & editing, Validation, Investigation, Funding acquisition. **Tom Broomhead:** Writing – review & editing, Validation, Resources, Project administration, Investigation, Funding acquisition, Data curation. **Bilal El-Dhuwaib:** Writing – review & editing, Validation, Resources, Investigation, Data curation. **Nicolas Martin:** Writing – review & editing, Validation, Resources, Project administration, Investigation, Funding acquisition, Conceptualization. **Gerry McKenna:** Writing – review & editing, Validation, Methodology, Investigation, Funding acquisition. **Anousheh Alavi:** Writing – review & editing, Validation, Supervision, Resources, Project administration, Data curation, Conceptualization.

Declaration of competing interest

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