Experiences of communication changes following spinal cord injury: a qualitative analysis

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ABSTRACT

Purpose: Voice and communication changes can occur following cervical spinal cord injury due to dysfunction of the respiratory and phonatory subsystems. Few studies have explored the “lived experience” of communication changes post cervical spinal cord injury. Furthermore, the impacts of these changes on community activity/participation and requirements for psychosocial adjustment have not been well-elucidated. The current study explored the experience of communication changes in non-ventilated individuals following cervical spinal cord injury, using a biopsychosocial framework.

Materials and Methods: Semi-structured interviews were conducted with 14 community-dwelling non-ventilated individuals with cervical spinal cord injury. Thematic analysis was undertaken using an inductive approach. Themes were subsequently coded against domains of the World Health Organization International Classification of Functioning Disability and Health model, using established linking rules.

Results: Four main themes were identified: (1) how communication has changed; (2) difficulties getting the message across, (3) the multifactorial impact of communication changes on everyday life; and (4) strategies/support to adjust to communication changes. Communication changes had multifaceted effects on participants’ functioning, and were represented equally across the Body Functions (12 codes), Activities/Participation (12 codes), and Environmental Factors (11 codes) domains of the model.

Conclusions: Individuals with cervical spinal cord injury perceive and experience meaningful changes on communication function post-injury, with salient impacts to daily-living and social participation.

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Introduction

Communication changes are potential sequelae following cervical spinal cord injury (SCI). Respiratory dysfunction resulting from weakened or paralysed respiratory muscles has been shown to result in consequential impacts to respiratory-phonatory control for speech production [1–3]. Dysfunction at the laryngeal level due to recurrent laryngeal nerve palsy and/or intubation trauma can also impact on voice production, commonly manifesting as a breathy, rough, harsh or strained vocal quality [4,5]. The combined effects of these deficits can have further impacts on prosody, including pitch and loudness variability and rate of speech, culminating in reduced intelligibility in conversation [1–6].

Whilst the specific nature of the speech and voice deficits of individuals post cervical SCI are well established, there has been a relative paucity of research on the impact of communication changes on daily living and social participation in this population. Recent studies have suggested that although objective physiological measures of speech and voice function may only reveal mild deficits [1,2], the impact of these deficits on activity and community participation can be multifaceted and marked for some individuals [6]. Nygren-Bonnier et al. [7] demonstrated that...
individuals with decreased lung function following cervical SCI reported difficulties with voice function in social situations, such as talking over background noise, over the telephone, and asking for assistance. More recently, Ward et al. [8] found that all participants reported a degree of limitation in their fulfillment of everyday roles within the community setting, with three individuals reporting considerable negative functional/lifestyle impacts from their communication impairments, using quantitative rating scales (Voice Handicap Index, Communication Participation Item Bank, AustOMS). Although these studies have furthered our knowledge of the impact of communication changes following cervical SCI, the use of standardized, and primarily clinician-rated measures have limited the exploration from the individual’s perspective. Consequently, our understanding of the issues faced by people with communication changes following cervical SCI and what is needed to help optimize their adjustment and successful living with these changes is not yet fully understood.

A small number of studies have utilized a qualitative approach to explore patient perspectives of important concepts related to cervical SCI rehabilitation, such as psychosocial resilience and adaptation following injury [9], the experience of care dependence [10], and the use of technology to support transition back into the community [11]. Specific to communication, Laakso and colleagues [12,13] explored the communication experience of individuals with cervical SCI specifically requiring mechanical ventilation. This study identified key themes relating to: changes in the nature of speech production using mechanical ventilation, the use of alternative and augmentative communication strategies and technology, relationships and dynamics with communication partners, and a lack of knowledge and support from healthcare professionals regarding ventilator-dependent communication. The authors also examined the experiences of key communication partners [12] who reported on challenges and limitations with communication exchanges, the need to assume different roles to support communication, and associated emotional reactions related to coping with their loved one’s ventilator-dependent speech. These preliminary findings support the wide-ranging effect of communication changes in individuals with cervical SCI who require mechanical ventilation. However, further investigation is required into the experiences of non-ventilator-dependent individuals, as the nature of their communication exchanges, as well as the types of communicative environments, may potentially differ due to the restrictions of mechanical ventilation.

In taking a more holistic approach to describing the experience of individuals post cervical SCI, it is also imperative to use a consistent language so that findings from studies can be compared and coalesced. The International Classification of Functioning, Disability and Health (ICF; World Health Organization [WHO], [14]) is a well-established framework which describes an individual’s functioning from a biopsychosocial perspective, in standard and internationally-recognized terminology. The ICF defines functioning from the perspective of the body, the individual and society in two parts: [1] functioning and disability, comprising of body structures (anatomy), body functions (physiological and psychological), activity (execution of tasks/actions), and participation (involvement in a life situation); and [2] contextual factors, incorporating environmental and personal factors [14]. This makes it an ideal model for reflecting the widespread, complex, and multifaceted nature of functioning and disability in chronic conditions such as cervical SCI [15]. Hartley et al. [16] reviewed SCI literature specifically related to communication within the context of the ICF model, mapping the collective outcome measures and findings to ICF codes, and comparing these with existing ICF coding core sets for SCI. However, the ICF codes proposed by Hartley et al. [16], as well as existing SCI and neurological ICF core sets, have primarily been built from quantitative studies, and again, have largely been constrained to individuals requiring mechanical ventilation. Thus, the use of a qualitative approach for the mapping of communication changes in cervical SCI, and specific inclusion of non-mechanically ventilated individuals, is required, in order to broaden our insight into the experiences of communication changes following cervical SCI, and potentially elucidate a more representative set of ICF codes relevant to communication in the cervical SCI population.

Therefore, the primary aim of the present study was to explore the experience of communication changes in individuals following cervical SCI (not mechanically-ventilated), using a qualitative approach. The secondary aim was to map the key concerns and issues identified by these individuals to relevant domains and categories of the ICF framework. Overall, this study seeks to provide a deeper understanding of the challenges faced by individuals with communication changes following cervical SCI, from a biopsychosocial perspective, and elucidate the skills and support required to adjust to these changes in order to live successfully post injury.

Materials and methods

The current study used a qualitative descriptive methodology consisting of semi-structured interviews to explore the nature and impact of communication changes in individuals with cervical SCI. Qualitative descriptive studies draw from naturalistic inquiry and involve the study of real world situations as they occur naturally [17]. This type of methodology was adopted due to the exploratory nature of the primary research question. A biopsychosocial framework, specifically the ICF model, was chosen as it recognizes that disability is not solely the result of impairment in body structure or function, but is mediated by environmental and personal contexts [18]. This study formed part of a larger research project examining the nature and extent of voice and communication function and patient-reported outcomes, components of which have been published previously [8].

Participants

Ethical approval for this study was provided by the appropriate hospital ethics committee (HREC/13/QPAH/312). Individuals who had sustained a cervical SCI resulting in neurological impairment above C8, anytime up to six years prior to recruitment, who had some degree of functional impairment resulting from injury as per the American Spinal Injury Association Impairment Scale category A-D [19] and who lived within the greater Brisbane metropolitan area (to facilitate data collection at home or at the hospital service with minimal travel burden as preferred by patient) were eligible for participation. Potential participants were identified through a statewide spinal injury outreach team in Queensland, Australia. Of 62 potential participants living within the greater Brisbane metropolitan area, 43 were excluded due to: moderate to severe cognitive impairment, preexisting or post-injury conditions affecting communication not related to cervical SCI (e.g., stroke), or ventilator dependence, leaving 19 individuals who were approached for recruitment. Of these, 14 provided informed consent.

A de-identified summary of demographic characteristics of each participant is provided in Table 1. The cohort contained 11 males with a mean age of 41 years (SD = 16.55 years), who had sustained injuries predominantly to C4 or C5 and were on average...
59.07 months post injury (SD = 13.27 months). Seven participants were employed at the time of interviews. Three participants wore an abdominal binder during the interviews. Clinician ratings of speech and voice function of these 14 individuals (detailed analysis published elsewhere [8]) found all had reduced maximum phonation times and no individual had all speech parameters rated within the normal range. Nine had at least 1 perceptual parameter which was moderately impaired and of these, 2 were rated as having moderate impairments on >5 parameters. Voice quality was mildly impacted in 93% of the cohort, with many having rough and strained (71% and 64% respectively) vocal quality [8].

### Data collection

Interviews were conducted by a research assistant, with a background in speech pathology, who was appropriately skilled in qualitative data collection techniques. The research assistant was not involved in the clinical care of any participants. Interviews were conducted using a semi-structured interview guide (see Supplementary Material) that consisted of a series of open-ended questions which explored issues related to communication changes and interactions across environments, and strategies used to adjust to communication changes. Where appropriate, interview questions were adapted, omitted, and/or elaborated on an individual basis to encourage participants to reflect openly about their experiences [20], and probing questions were used to elicituate further information as required. Each interview was audio-recorded and transcribed verbatim. Interviews took no more than 30 min and participants were offered breaks if required. All interviews took place in a location convenient for the participant, with most occurring in their homes.

### Data analysis

#### Qualitative analysis

Thematic analysis of the interview transcripts was undertaken using an inductive approach, allowing for the coding of data based on evident themes without any preexisting coding frame [20]. Thematic analysis and coding was conducted as per the steps outlined by Braun and Clarke [21]. In the first step, the second author (RN) read the participant transcripts in their entirety and initial thoughts were written down. Transcripts were then imported into NVivo 10 qualitative analyses software for coding. An open-coding approach [22] was used to systematically examine the transcripts and generate initial codes (step 2). Following step 2, the initial codes were examined to ensure consistency across participants and data were organized into potential categories and sub-categories (step 3). All working categories and sub-categories were then examined to ensure any patterns that emerged were reflective of the raw data. Related categories were then grouped into overarching themes (step 4). Ongoing analysis was conducted to refine each theme and each theme was reviewed in relation to each original transcript to ensure that they were representative and an accurate interpretation of participants’ experiences (step 5). To ensure agreement, the first author (LW) reviewed codes, categories and themes at each stage of analysis and consensus was established.

#### ICF mapping process

Categories and sub-categories identified during the qualitative analysis were linked to the components of the ICF according to established linking rules [23,24]. The ICF uses an alpha-numeric system to represent category codes. The letters b, s, d, and e are used to identify Body Functions, Body Structures, Activities and Participation, and Environmental Factors respectively. These letters are followed by a numeric code that represents the chapter number (domain) of the ICF, followed by additional levels of coding [14]. Two researchers (RN & LW) linked each category and sub-category to the most precise ICF code using the descriptors provided in the ICF manual [14]. Where there was disagreement, data were reviewed until a consensus decision was reached.

### Results

Four main themes were identified based on participants’ descriptions of their experiences of living with and adjusting to communication changes post-cervical SCI. The first three themes focused on how communication had changed, the impact of these changes on communication interactions, and the resultant effect on participants lives. The final theme described support mechanisms and strategies used by participants in order to adjust to communication changes. These four themes were composed of 19 categories and 7 sub-categories. A total of 22 categories/sub-categories from the qualitative interviews were able to be linked to 35 ICF codes across the Body Functions (12 codes, 34%), Activities and Participation (12 codes, 34%), and Environmental

### Table 1. Participant demographics (n = 14).

| Participant code | Gender | Age decade | Months post injury | Injury level and type | VHI total score<sup>a</sup> | CPIB summary score<sup>b</sup> | Mobility | Employment status |
|------------------|--------|------------|--------------------|-----------------------|-----------------------------|-----------------------------|----------|------------------|
| ST002            | M      | 50–59      | 68                 | C4 D                  | 2                           | 30                          | MW       | NW               |
| ST005            | M      | 30–39      | 57                 | C4 B                  | 15                          | 30                          | EW       | NW               |
| ST006            | M      | 50–59      | 37                 | C4 B                  | 15                          | 28                          | EW       | NW               |
| ST008            | M      | 20–29      | 74                 | C4 A                  | 0                           | 30                          | MW       | E Full-time      |
| ST009            | F      | 30–39      | 47                 | C5 D                  | 2                           | 30                          | MW       | NW               |
| ST010            | M      | 30–39      | 72                 | C3 B                  | 53                          | 12                          | EW       | E, S             |
| ST011            | M      | 60–69      | 64                 | C4 C                  | 56                          | 16                          | EW       | NW               |
| ST012            | M      | 70–79      | 68                 | C5 C                  | 24                          | 23                          | EW       | Retired          |
| ST013            | M      | 30–39      | 55                 | C4 C                  | 16                          | 26                          | EW       | E Part-time      |
| ST014            | F      | 50–59      | 56                 | C2 C                  | 71                          | 19                          | EW       | NW               |
| ST015            | M      | 20–29      | 75                 | C5/6 B                | 12                          | 28                          | EW       | E Part-time; S Part-time |
| ST016            | F      | 20–29      | 46                 | C5 B                  | 4                           | 30                          | EW       | E Part-time      |
| ST017            | M      | 20–29      | 37                 | C5 A                  | 25                          | 24                          | MW/EW    | NW               |
| ST020            | M      | 30–39      | 71                 | C6/7 A                | 39                          | 26                          | MW       | E Full-time      |

<sup>a</sup>VHI = Voice Handicap Index (Scores 0 – 30 indicate mild impairment, 31 – 60 indicates moderate impairment, 71 – 100 indicates severe impairment).

<sup>b</sup>CPIB = Communicative Participation Item Bank (High scores indicate less interference in participation).

EW: electric wheelchair; MW: manual wheelchair; NW: not working; S: study; E: employed; S: study.
Factors (11 codes, 32%). The ICF codes linked to specific qualitative categories and sub-categories are detailed in Tables 1–4, along with participant quotes. One sub-category from the qualitative data was identified as a Personal Factor and the remaining three categories were not able to be coded.

**Theme 1: How communication has changed**

The majority of participants discussed changes they had experienced to their communication abilities as a result of their SCI (Table 2). However, there was a mix between those participants who recognized changes in their communication and those who had to be told by a carer or family member that their communication had changed. One participant noted that “you know in yourself the difference when I [sic] speak to people.” [participant ST006] while another stated “you weren’t aware of it [communication difficulties] … I had someone [carer] say ‘you’re still having a problem with getting your breath’” [participant ST002]. This awareness or lack of awareness of communication changes was unable to be coded to the ICF (not coded [nc]). The majority of participants commented on the changes to their lung capacity and its impact on sentence length (b440; b445; b460), vocal volume (b3100), projection of voice (b3100), quality of voice (b3101; b340) and fatigue (b4552) during a conversation. One participant summed up the experience stating “I can’t reach any volume, I can’t shout, and quite often the voice goes into a croak just like a frog” [participant ST011] while another commented that “It took me a while to actually get the words, to find the breath to speak, and just speaking … I was just sentences after sentence would take me a while. I would have to catch my breath.” [– ST016].

**Theme 2: Getting the message across**

Participants highlighted the importance of communication (nc) and the “ability to talk, [and] that people can understand you”
Table 4. Theme 3: Multifactorial impact of communication changes

| Category          | Example participant quotes (n = 14)                                                                 | ICF code and name (mapped to category) |
|-------------------|------------------------------------------------------------------------------------------------------|--------------------------------------|
| Emotional responses | “you felt useless … you’d get the shits and just withdraw and think bugger it I won’t say anything” – ST005 | b152 Emotional functions             |
|                   | “I’m angry, I’m frustrated trying to get stuff out [words] for a start and then having to repeat all the time.” – ST014 | d740 Formal relationships            |
|                   | “sometimes I talk too quickly and therefore … it’s a lot quieter as well so it makes it a lot [more] difficult … and that can be the breakdown between our relationship between carers.” – ST010 | d750 Informal social relationships    |
|                   | “when I’m with a crowd I don’t bother trying to become involved with the conversation because I won’t be able to get through so I just don’t bother … And then they turn around and say ‘what’s up with you today, you a bit quiet?’” – ST011 | d760 Family relationships            |
|                   | “There is a little bit of miscommunication there too … half the problem the last time I saw my daughter, she thought was in a bad mood when I was actually sick and I couldn’t breathe properly” – ST014 | d770 Intimate relationships          |
| Relationships     | “You do get cut out of conversations, you can hear and they’ll talk to you but for you to talk to them back in a loud bar or something you do get cut out of the conversation …” – ST020 | d9205 Socializing                    |
| Social life       | “I got paranoid like probably the first three weeks of work jus asking ‘can you ring the number and can you tell me if I talk clearly?’ because the whole thing is customer relations is what I do.” – ST010 | d850 Remunerative employment         |

[participant ST006] (Table 3). In addition to the physiological changes discussed in theme 1, participants also noted how the communication environment could impact on their interactions particularly in noisy (e2501), social situations: “The … hard thing is in social atmospheres, especially when you’re lower down [in a wheelchair] and it’s hard to talk to people who are high up.” [participant ST013] Participants also identified a lack of understanding from communication partners (d710; d720; d730; e310; e320; e340; e345) as a barrier to communication interactions “people would finish off your sentences and you’d get the craps [frustrated] with that” [participant ST005]. For one participant, the time that it took to get the message across impacted on communication interactions (d330; d350) “you want to converse with people but at the same time it’s like this conversation seems like it’s gonna [sic] go on forever, ‘cause you’re just trying to get the point across or say things across to people which going to take you a while … you run out of breath” [participant ST016].

Theme 3: Multifactorial impact of communication changes

Approximately one-third of participants noted the pervasive effects of communication changes on their emotions, relationships, social life, and work (Table 4). These participants expressed feelings of anger (b152), frustration (b152), and sadness (b152) towards their communication changes and the effect on their communicative interactions “I’m angry, I’m frustrated trying to get stuff out [words] for a start and then having to repeat all the time” [participant ST014]. This was also noted to impact on various relationships within participants lives (d740; d750; d760; d770). One participant spoke of the impact on his relationship with his wife “[my wife] and I don’t have the conversations like we used to have for the simple reason … I can’t speak” [participant ST011]. A few participants also spoke of the impact that their communication changes had had on their social lives (d9205) “I had a lot of family and friends come up and visit us at the hospital and we’d go out the back and have a barbeque and something you couldn’t sort of gasbag [have a conversation] as much because I couldn’t get it out” [participant ST005]. One participant discussed how their communication changes also impacted their work (d850): “I got paranoid like probably the first three weeks of work just asking ‘can you ring the number and can you tell me if I talk clearly?’ because the whole thing is customer relations is what I do.” [participant ST010].

Theme 4: Strategies and support to adjust to communication changes

The final theme to emerge from the interviews, highlighted the lack of perceived support provided for communication changes following cervical SCI from health professionals (e355) (Table 5). The majority of participants reported that they had not received any services to assist them with adapting to communication changes following cervical SCI and many were unsure of whether any support would be beneficial “I’m not really sure if it [speech therapy] would help or not. It might help” [participant ST017]. A number of participants admitted that they had a limited understanding of the role of a speech pathologist (e355; e3800) and were therefore unsure as to whether speech pathologists could be of any value to people with cervical SCI “I didn’t think of it as a speech therapy thing to assist me. I thought it was something that occurred [communication changes following SCI] … I knew what the OT [occupational therapist] was but I never thought ‘oh speech therapy could help me’” [participant ST016].

As a result, participants discussed self-discovered strategies that they had adopted in order to cope and live with communication changes. A wide range of strategies were reported including specific strategies to increasing vocal projection (b445; b730) “I can bear down … pretty much forcing the air out of my lungs” [participant ST017] and intelligibility (b310; b320) “I’ve had to learn to slow down my speech and make sure I speak a bit more clearly and louder” [participant ST010]. Participants also reported speaking in shorter sentences (b330), asking for time to catch their breath (Personal Factor), using technology such as microphones when delivering speeches (d360; e125), and drinking liquids (e1100) or sucking on lozenges (e1101) to assist with communication interactions. A small number of participants also discussed the support received from family (e310), friends (e320) and coworkers (e325) “they’ve understood what the situation is … they don’t think any worse of me.” [participant ST006].

Discussion

This is the first known study to explore the nature and impact of communication changes in non-ventilated individuals with cervical SCI, using a qualitative, biopsychosocial approach. The findings of the current study demonstrate that non-ventilated
individuals with cervical SCI do perceive and experience meaningful changes to their communication function. The majority of participants commented on the changes to their lung capacity, voice quality, and vocal volume/projection, and the impact of these on utterance length and fatigue in conversation. This is consistent with previous quantitative studies which have reported impairments albeit largely mild, in the respiratory, phonatory, and prosodic aspects of speech production, with particular difficulties sustaining voice and maintaining vocal intensity across long speech tasks [2–5,8]. Individuals in the current study also reported that their communication changes had a multifaceted impact on functioning and participation, regardless of the severity of physiological impairment. This contrasts with our recent companion study [8] which by comparison found relatively mild impacts on the performance of activities and participation related to communication, using quantitative measures. This highlights the unique benefit of qualitative methodology to glean deeper understanding of the lived experiences of people with communication changes following cervical SCI, and potentially reveal important findings that quantitative scales may not be sensitive enough to capture.

Despite the pervasive impact of communication changes on activity and participation, members of the current study cohort reported that they had developed strategies to adjust to these difficulties and return successfully to meaningful daily activities and vocation. Unfortunately, the process of adjustment was required to be self-driven, as the vast majority had not received any services specific to supporting communication following cervical SCI. This is consistent with findings reported by Laakso and colleagues [13] where ventilated respondents reported resorting to self-directed trial and error approaches and seeking information from other sources. In the current study, the cohort also appeared to lack understanding of the role of the speech pathologist. Previous studies have reported that whilst the speech pathologist plays a key role in the acute inpatient management of individuals with cervical SCI, particularly in regards to tracheostomy weaning [25], dysphagia, and cognitive-communication therapy [26], the involvement of speech pathology post-discharge is often minimal [27]. These collective findings demonstrate not only a potential service gap in the provision of holistic post-acute rehabilitation of cervical SCI, but also a need for further education to consumers and services regarding the important benefit of speech pathology involvement with the non-ventilated cervical SCI population. Research has highlighted the importance of functional communication for facilitating successful transition back

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**Table 5. Theme 4: Adjustment to communication changes.**

| Category Sub-categories | Example participant quotes (n = 14) | ICF code and name (mapped to category) |
|-------------------------|------------------------------------|---------------------------------------|
| Need for services for communication difficulties | “a mixture of speech therapy and psychological [sic]… it’s so different being at home and then your interactions are different [than in hospital] when you come out into the community where you’ve got to be with taxi drivers, you’ve got to deal with carers, you’ve got to deal with people at the shops” – ST015 | e355 Health professionals |
| Role of speech pathologist | “I don’t know if she was a speech pathologist … I think I did speak with a speech um lady but … I can’t remember what we were doing … we had to eat this crap [modified food/fluid] for a while and then … I think we didn’t really have much to do with her [speech pathologist].” – ST005 | e355 Health professionals | e5800 Health service |
| Self- discovered strategies | Advocating for self | “I would tell people … ‘just give me a sec [second], I’m trying to catch my breath’ and then everyone would totally understand.” – ST016 | PF (Personal factor) – coping skills |
| Use of technology | “You ever compensate, you seem to get louder and talk louder.” – ST020 | b310 Voice functions |
| Clearly articulating | “on job sites … I had to make my instructions clear in whatever I told whoever it was if I wanted something done specifically” – ST006 | b320 Articulation functions |
| Speaking in shorter sentences | “Instead of people asking questions you kinda [sic] made the answers short that way you wouldn’t be using so much of your voice” – ST016 | b330 Fluency and rhythm of speech functions |
| Projection | “I can bear down by making my body go forward, yeah, by pretty much forcing the air out of my lungs.” – ST017 | b445 Respiratory muscle functions |
| Vocal preparation/hygiene | “I use a lot of technology that’s like microphones and stuff.” – ST010 “… use your phone to call someone [rather than talking from a distance]”. – ST020 | d360 Using communication devices and techniques |
| Use of technology | “I use a lot of technology that’s like microphones and stuff.” – ST010 “… use your phone to call someone [rather than talking from a distance]”. – ST020 | e125 Products and technology for communication |
| Vocal preparation/hygiene | “Drinking liquid … I also got [sic] lozenges that I suck which help to relax or soothe the things down there [larynx]”. – ST011 | e1100 Food |
| Vocal preparation/hygiene | “If I knew I’m going to see the doctor for example, I have a lolly [candy] before I go in.” – ST011 | e1101 Drugs |
| Sources of support | “They’ve [family and friends] understood what the situation is and … they don’t think any worse of me.” – ST006 | e310 Immediate family |
| Sources of support | “My bosses always would say if you feel like you need to have a rest just … take a 10-15min break if you have to, that’s no problem at all.” – ST016 | e320 Friends |
| Sources of support | “I also got [sic] lozenges that I suck which help to relax or soothe the things down there [larynx]”. – ST011 | e325 Acquaintances, peers, colleagues, neighbors and community members |
into community life [28]. This calls for the development of service models that incorporate a specific focus on maximizing communication function, and additional supports relating to adjusting to communication change following cervical SCI, to allow for greater patient empowerment and participation in life roles. Such services are particularly important, given that individuals with cervical SCI are increasingly discharged earlier in their recovery, and are living longer with the consequences of their injury. Thus, they require synergistic and holistic transitional services to optimize their successful long-term functioning within the community [29,30].

In mapping theme categories and subcategories to the ICF model, the current study has demonstrated the complex and diverse impact that communication changes have on the functioning of individuals with cervical SCI, as well as the impact of environmental factors. There was an equal spread of codes across the body functions (12 codes), activity/participation (12 codes) and environmental factor (11 codes) domains, which is consistent with previous studies that have applied the ICF model to understand more wide-ranging impacts of cervical SCI, such as mobility and self-care [31]. The specific codes identified as relevant to communication in the current study also align with the findings of Hartley et al. [16], with particular concordance across the coding of voice and speech functions (b3), respiratory functions (b4), communication (d3), and products and technology (e1). Interestingly, contrary to Hartley et al. [16]’s review, the current study did not map any of the themes and categories/subcategories to body structure ICF codes, as participants did not comment on the influence of any anatomical deficits on their experience of communication changes. This may reflect the qualitative nature of the study with focus on the lived experience rather than the impairment level. As a whole, the distribution of coding across ICF domains is likely reflective of the multidimensional and overarching role that communication plays in everyday life, including basic and complex interpersonal interactions, maintaining relationships, returning to work, and participating in social events. This provides further evidence to suggest that services to support and rehabilitate communication function in cervical SCI should also be multifaceted, and take a biopsychosocial perspective, incorporating daily activities and community participation as a core focus for goal-setting, and ensuring that the communicative and social environment is optimized to facilitate successful communication.

Some limitations to the current study are acknowledged. Firstly, the sample size for the semi-structured interviews was influenced by participant availability within a geographical region and saturation of themes was not determined. However, it should be noted that the current sample size is comparable to previous qualitative studies in cervical SCI [11–13], and exceeds the recommendations by previous qualitative methodology literature which suggests that data saturation can be reached after 6–12 interviews for nonprobabilistic samples [32]. Future studies could consider using videoconferencing to collect interview samples, allowing participants from wider geographical regions to participate. Access to larger participant numbers would allow future research to use other methods, such as data saturation, to dictate sample size. Secondly, all participants in the current study were over three years post-injury, therefore experiences relating to Theme 4 (adjustment post-injury) may not be representative of individuals who are in the earlier post-acute phases. Finally, the current study did not explore the lived experiences of communication changes post cervical SCI from the perspective of family members, carers or significant others. Previous research has demonstrated that communication changes can have potentially negative psychosocial impacts on carers and key communication partners [12,33–35]. Hence further research is required to explore the nature of “third-party disability” experienced by carers of individuals with communication difficulties with cervical SCI, in order to understand how to best support these key communication partners, and provide services for coping and adjustment.

Conclusion

The current cohort of individuals with cervical SCI reported experiencing meaningful changes to their communication function post-injury. These changes exhibited complex and pervasive impacts on functioning and participation, which were represented equally across the body functions, activity/participation and environmental factor domains. In addition, a number of personal factors were recognized as contextually relevant to the communication experiences of these participants. The current study highlights need for further elucidation of the speech pathology role in the assessment and management of communication changes in non-ventilated cervical SCI patients, particularly in the post-acute setting, and demonstrates the potential benefit of adopting a biopsychosocial approach to ensure that transitional care services are holistic and maximize patients’ capacity to live successfully post-injury.

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Disclosure statement

The authors have no conflicts of interest to disclose.

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