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Data Saturation in Qualitative Research on Communication Experience of Intubated Conscious Patients and Nurses

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Abstract
There is a gap that exists to prove the selection of the appropriate number of participants for qualitative studies. The purpose of this study was to determine and justify optimal sample size to explore the communication experiences of nurses and intubated patients. In-depth one to one interviewwith six (6) patients after extubating and eleven (11) nurses were employed in the study with purposive sampling techniques using open-ended questions. Inductive probing techniques were used to develop themes.To arrive at qualitative data saturation, the study used three key parts in its computation and assessment: base size, run length, and new information threshold, which is based on the more flexible approach of reporting saturation. Data saturation employed the formula; Saturation quotient = New theme/base theme; (data saturation was assumed at saturation quotient of ≤ 5%for new information threshold). Data saturation occurred at 7th interview series; starting with 23 new codes (Base themes) from 1st interview followed by series of interviews to reach a total of 41 new codes.The findings of the research highlighted an alternative way for calculating and reporting saturation of qualitative data using saturation quotient. This technique of arriving at optimal data saturation through calculation may be applied in other qualitative researches.

Keywords: Data Saturation, Phenomenology, Qualitative, Nurses, Patient Experience

Key points: What this paper adds

- This is the conceptual analysis of saturation in qualitative research with specific research topic.
- Clarifying the concept of saturation makes an important addition to the field of qualitative research methodologies.
- This study helps qualitative researchers understand the idea of saturation and its application through data collection strategy in specific research topic.

Introduction

Healthcare research is a thorough examination that produces trustworthy data on healthcare-related topics. Health research is classified into mainly two types: quantitative and qualitative methodology. Qualitative and quantitative research use different data collection methodologies(Hennink et al., 2019, Leydesdorff et al., 2020).The purpose of qualitative research is to comprehend the underlying meanings

of human experiences and behaviours through the collection, interpretation, and analysis of qualitative data that cannot be measured numerically. Communication in one such human experience for conscious intubated patients who cannot respond to the caregivers verballyis of great importance. Poor communication can result in life-threatening consequences(Tiwary et al., 2019). Thus, healthcare workers must make efforts to understand communication experience to achieve positive health impacts. Phenomenology is a strong research technique that is ideally suited for exploring difficult problems in healthcare research (Neubauer et al., 2019), like communication experience of conscious intubated patients and nurses.In phenomenological technique empathy and an understanding of the perspective of the researcher and the participant in relation to the phenomena under inquiry can be addressed utilizing a phenomenological qualitative method (Alhazmi & Kaufmann, 2022; Renjith et al, 2021).

The present study tries to find appropriate sample size to answer the research question "How do nurses and conscious intubated patients engage when communicating?" by carefully setting the research objective as, "To investigate how nurses and conscious intubated patients communicate." Examining the lived experience of cognizant intubated patients not only contributes to describing the communication experience, but also allows for a more comprehensive examination of the significance of communication for both patients and nurses (Perelló-Campaner et al., 2023).

In recent decades, qualitative research has gained popularity and acceptance across various fields (Mwita, 2022) including health care settings. However, although qualitative research appears to have achieved something of the stature of dogma, the data collection and the data saturation is still a subject of debate in the research world (Sebele-Mpofu, 2020). When collecting qualitative data, it is crucial for a researcher to not only determine whether the data has been adequately obtained, but also have to claim its trustworthiness.Qualitative studies rely on adequate data collection to address research questions, ensuring their validity (Hennink & Kaiser, 2022).Several earlier studies explored how researchers reach 'the saturation point' in qualitative studies(Felix Chukwuma Aguboshim, 2021,Guest et al., 2020).But the literature lacks clarity on how this point is attained (Mwita, 2022) in practice with case example of data collection to address specific research question. This paper has been driven by the dearth of lucidity in the current body of literature on particular topic of phenomenological research interest which focuses on data saturation while investigating the experience of conscious intubated patients and nurses experience on communication.

Methods

Research approach

For the present study the phenomenological context is the conscious intubation in patients and their experience on communication with nurses and vice versa. Phenomenology is an ideal research tool for health professions education (HPE) scholars to get insights from others' experiences. Phenomenology is a qualitative research approach that examines an individual's experiences in the world (Neubauer et al., 2019, Alhazmi & Kaufmann, 2022). Phenomenological studies are flexible approach to research problems related to lived experiences, unlike typical quantitative methods.

Sample and Sampling Techniques

In the present study data collection was done by purposefully selecting conscious intubated patients and nurses to illuminate their communication experience by adopting interview method. This type of sampling approach can obtain the qualities (opinions/experiences) of the specific demographic group (Chun Tie et al., 2019; Kandi, 2022). Data collection methods typically include interviews (Mwita,

2022). Patients who met the inclusion criteria, literate up to primary school level (Standard V), above the age of 18, and had been intubated for at least 24 hours were interviewed within 1 day of extubating.
The exclusion criteria for patients included unconsciousness, confusion, memory loss, sensory deprivation, need for sedatives, and mental health issues.And for nurses all who were posted in critical care area with experience of caring intubated patients and were not in resignation period.

Size Determination

The present study had employed data saturation to obtained sample size adequate enough to explore experience though interview with heterogenous group of six (6) conscious intubated patients after extubation and eleven (11) nurses. The collection of data continued until saturation was reached where same issuesappeared again and again.The use of saturation evaluated sample size for data adequacy to generate concepts (Hennink & Kaiser, 2019; Hennink & Kaiser, 2022).On average, saturation occurs by the 13th interview and usually has an impact on the outcome with saturation typically occur between the 9th and 17th interviews (Hennink and Kaiser, 2022).

Data saturation

Data saturation employed the formula
Saturation quotient = New theme/base theme; (data saturation is assumed at saturation quotient of ≤ 5%.for new information threshold) (Guest et al., 2020).
Data saturation was achieved with a base size of six interviews, a run length of two interviews, and a new information threshold of < 5%. This technique allowed for a more diverse description and reporting of saturation, as well as enhanced clarity and transparency (Guest et al., 2020). Data saturation was determined based on the base, runs, and saturation points, as well as the data used for each step, until the information threshold reached≤ 5%. The new themes for the seventhand final run of the interview series were one (1) from only one nurse. The saturation ratio was 4.3%, hence the interview with 11 nurses and 6 patients was terminated with data saturation. The interview series began with the researcher noting the first six interviews, which were done on four critical care nurses and two patients following extubating. Next, the number of unique themes identified by respondents was added up to 23, which is the denominator of Guest et al., (2020) calculation for data saturation. The new theme/base theme assumes data saturation at a quotient of ≤ 5% for the new information threshold.

Table 1-Interview series

Interview number*	1 N_1	2 N_2	3 N_3	4 N_4	5 P_1	6 P_2	7 N_5	8 P_3	9 N_6	10 P_4	11 N_8	12 P_6	13 N9	14 P7	15 N_9	16 N_{10}	17 N_{11}	18 N_{12}
Interview series	1						2		3		4		5		6		7	
New themes /interview	4	4	5	4	3	3	4	3	2	2	1	1	2	0	1	1	1	0

Base theme	23																					
Total theme							7		4		2		2		2		1					
Saturation quotient= New theme/ base theme							30%		17%		6.6%		6.6%		6.6%		4.3%					

* N for nurses and P for patients; number of interviews are expressed as numerical prefix to respondents and number of each respondent is subscripted below the N/P respectively.

Table 1 explains the step wise 1 to 7 colour coded interview series and saturation quotient

STEP 1 –researcher started by noting first six interviews conducted on four critical care nurses and two patients after extubating. Next the number of unique themes identified from the respondents were summed up to 23, which was the denominator of the equation proposed by Guest, 2020.

STEP 2—explains the run length of two from second interview series onwards. After reviewing those interviews four new themes from nurses and three from patients were obtained. The number of new base themes in this first run was seven with saturation ratio calculated to be 30%, thus interview was continued.

STEP 3—continued interviews of nurse and patients revealed 4 new themes. As the calculated quotient was 17%, interview was continued.

STEP 4 –New themes for the next run in the series is 1 each from nurses and the patients. Next the saturation ratio determined was 6.6% again, so interview was continued.

STEP5 – New themes for the next run in the series is 2 for nurseand no new information was obtained from patients. The saturation ratio determined was 6.6 %, so interview was continued.

STEP 6 – New themes for the 6^{th} run in the series is 2 from nurses and patients were no more interviewed as no new information was obtained in the previous series. The saturation ratio determined was 6.6 %, so interview was continued.

STEP 7 – New themes for the 7^{th} run in the series is 1 from only 1 nurse. The saturation ratio determined was 4.3%, so interview was stopped upon data saturation with eleven (11) nurses and six (6) patient interviews.

Setting

The research was conducted in the critical care units of a tertiary care centre with 500 beds, including 103 adult critical care beds. The critical care units had different types of patient diagnoses and a diverse staffing system, which ensured maximum contextual variety.

Data Collection Instruments and Procedure

Data collection tool

This section briefly discusses common data collection methods mainly the interview which is employed.

Interviews

The phenomenological interview adoptedwas in two independent methodologies that intersected in various ways, described as two layers (Høffding et al., 2021).

1. The first tier was the actual interview, during which the interviewer had prepared an interview guide for one-on-one interviews with participantsusing open-ended, non-structured questions.
2. In tier two, the majority of time is spent interpreting the interview and drawing phenomenological findings. To reduce duplication and large volumes of data, data collection and analysis were done concurrently until data saturation occurred.

Data analysis

Rather than constantly following a sequence, data analysis required coding to discover themes applying six-phase guide of theme analysisin accordance with Braun & Clarke (2006)thematic analysis, conducted by reading data back and forth (King et al., 2019).

Step 1: Get acquainted with the data-transcribing verbatims by reading the scripts several times.

Step 2: Create starting codes-initially 23 new codes derived from 1st interview series followed by new codes of total 41 till 7th interview series.

Step 3: Searching themes- that highlighted the concept by focusing on items noteworthy or intriguing about the study issue (Ayton et al., 2023) like theme "Areas of Communication Need" derived from patients' unique physical, psychological and spiritual needs.

Step 4: Re-evaluate the themes-

To conclude, the researcher made a few changes at this point.

- The researcher combined the lack of time theme with communication constraints, dividing it into two subthemes: structural and functional.
- The researcher developed a new theme on communication types with two subthemes: verbal and nonverbal.
- A new theme was created by combining the demand for communication with the lack of communication means. - Importance of standardized communication tools
- Finally, the researcher organized areas of communication need into a new theme: expressed need.

Step 5: Define concerned topics- links between themes and contained story in outcome and conversation about what nurses and patients feel during communication and what they hope to gain from it were defined.

Step 6: Write-up.

Writing up the end product of research in a report that includes both the findings and the discussion, such as an in-journal article or dissertation.

Results

Results are organized into two main categories.

Table 2-Participants' background information.

Informant code* (n=17)	Profession	Age	Gender	Qualification	Years of experience in Critical care	Number of intubated days	Critical care area
$1N_1$	Nursing	24	Male	Bachelors	2	N. A^	ICCU

$2N_2$	Nursing	21	Female	Bachelors	1	N. A^	ICCU
$3N_3$	Nursing	29	Female	Diploma	5	N. A^	ICCU
$4N_4$	Nursing	21	Female	Bachelors	1	N. A^	ITU(Gastro)
$7N_5$	Nursing	30	Female	Diploma	7	N. A^	ITU(Neuro)
$9N_6$	Nursing	22	Female	Bachelors	2	N. A^	ITU(Cardiac)
$11N_7$	Nursing	25	Female	Diploma	3	N. A^	ITU
$13N_8$	Nursing	24	Female	Bachelors	2	N. A^	ICCU
$15N_9$	Nursing	22	Female	Bachelors	1	N. A^	ITU(Gastro)
$16N_{10}$	Nursing	26	Female	Diploma	3	N. A^	ITU(Neuro)
$17N_{11}$	Nursing	27	Female	Diploma	4	N. A^	ITU(Cardiac)
$5P_1$	Service	41	Male	Bachelors	N. A^	5 Days	ICCU
$6P_2$	Retired teacher	62	Female	M.A# (Bengali)	N. A^	1 Day	ITU(Gastro)
$8P_3$	Service	28	Male	Bachelors	N. A^	15 Days	ITU(Neuro)
$10P_4$	Home maker	75	Female	Class XII passed	N. A^	3 Days	ITU(Cardiac)
$12P_5$	Business	48	Male	Bachelors	N. A^	7 Days	ITU
$14P_6$	Business	58	Male	Bachelors	N. A^	7 Days	ICCU

- Masters in arts; *- Respondents are represented as N for nurses and P for patients; Number of interviews are expressed as numerical prefix to respondents, Number of each respondent is subscripted below the N/P respectively; ^- N. A -not applicable

2. Findings from qualitative data-

Finally, after thematic analysis from 17 interviews, four themes emerged which is supported by the verbatim in Table 2. After reading and re reading of Preliminary themes, researcher made a few modifications at the final stage to evolve at following final themes.

- The researcher combined the lack of time theme with communication constraints, dividing it into two subthemes: structural and functional.
- The researcher developed a new theme on communication types with two subthemes: verbal and nonverbal.
- A new theme was created by combining the demand for communication with the lack of communication means. – necessity of standardized communication tools
- Finally, the researcher organized areas of communication need into a new theme: expressed need.

Table 3- quotes related to themes

Theme	Verbatim
1. Communication type- verbal and non-verbal	Nurse- “Touch could also serve as a time to reaffirm each person's unique answer”. Nurse- “though unable to respond verbally patients even tried to response affirmation through their eye blinking”. Patient- “I gave indications through signals, but most of time the nurse didn't comprehend.”

2. Expressed need physical, psychological and spiritual	Nurse- "They usually ask for suctioning and turning around." Nurse- "I just hold their hand at that time of restlessness due to anxiety." Nurse- "Many times, when we came near the bedside, they just smiled at us." Patient- "Holy Water wasn't allowed but the nurse dipped cotton and soaked my lips, I felt like crying."
3. Barriers of communication-structural and functional	Nurse- "Speaking with awake and intubated patients is a challenging and time-consuming activity." Nurse- "had a brief period to spend by my patients' bedsides due to lots of documentation work". Patient- "Nurses appeared to be hurrying always." Patient-"It was both frightening and annoying to hear the beep all the time." Nurse- "patients seem to be frightened when emergency of another patient happened, they were eager to know other's health condition".
4. Necessity of standardised communication tool	Patient-"if I could express my exact need to them,cues were mostly misinterpreted." Nurse- "Because the patients are unable to speak, interacting with them takes time. Having a communication tool would facilitate more efficient communication between myself and these patients. ". Nurse- "Research studies show that there are a lot of aids, like communication boards and picture cues, but nurses have nothing to use them here."

Discussion

The data showed that patients and nurses were concerned about critical physical demands such as suctioning, position adjustments, and thirst. Other than this, individuals also had unmet psychological needs, such as the inability to express their emotions and state of mind. Findings were echoed in other studies (Ariffin et al., 2020;Nuttapol Chaihan and Bunthan, 2023; Karlsen et al 2023; Rababa & Al-Sabbah, 2023; Yadak et al., 2017).

Nurses and patients both mentioned time shortage in their communication experiences as reiterated stated by Leung, (2018) where communication takes a significant amount of time and effort, as well as being emotionally and physically stressful.

The majority of nurses and patients in the current study requested a proper communication tool. Earlier studies implied use of communication-assistive materials or technology improves nurse-patient communication, reduces frustration, and speeds up determining patient needs (ten Hoorn et al, 2016; Ju et al., 2021). Such a tool was not currently in use at the study location. Based on the other study findings, a suitable communication tool might be built to improve communication between nurses and patients. Interviews reflected the expressed willingness to use communication tool if supplied.

But most noteworthy findings from the study was the justified data saturation at 17 interviews from which themes could be generated and also supported by previous studies. Data saturation at sixteen or

less interviews for other studies too yielded theme (Hagaman & Wutich, 2016; Guest et al., 2020; Young & Casey, 2018). This signifies the suitability of the data saturation calculation adopted for the present study which may be replicated in other phenomenological studies as well. Moreover, the application of this approach to phenomenological perspective could be tested in continuation to previous work on grounded theory by Guest et al, (2020).

Conclusion

The current study's purpose was to acquire insight into the current pattern and experience of communication between nurses and awake intubated patients by obtaining a sample size that was sufficient through qualitative interview. When gathering qualitative data, it was critical for the researcher to not only to establish whether the data was gathered adequately, but also to assert that it was trustworthy and credible.

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