Telemedicine in postoperative follow-up of STOMa PAtients: a randomized clinical trial (the STOMPA trial)

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Background: A stoma has severe impact on the patient’s quality of life (QoL). Postoperative home community follow-up by teleconsultation (TC) and stoma nurses may reduce the burden of travel and improve QoL.

Methods: A university hospital and five district medical centres participated. Patients with a stoma were randomized to follow-up by either TC (intervention) or hospital (control). Stoma nurses performed the clinical examination at the TC studio, aided remotely by hospital nurses and surgeons. The primary endpoint was the EQ-5D™ index score; secondary endpoints were the Stoma Quality-of-Life Scale, the OutPatient Experiences Questionnaire, and use of hospital resources.

Results: A total of 110 patients were randomized to hospital (58 patients) or TC (52) follow-up; 64 patients (hospital 38, TC 26) were followed for more than 12 months and 246 consultations (hospital 151, TC 95) were performed. There were no differences in QoL: EQ-5D™ index score (P = 0.301) and EQ-5D™ visual analogue scale (VAS) score (P = 0.775); Work/Social Function (P = 0.822); Sexuality/Body Image (P = 0.253) and Stoma Function (P = 0.074). Hospital follow-up performed better for organization of care (staff collaboration, P = 0.004; met same persons, P = 0.003) and communication (surgeon understandable, P < 0.001; surgeon caring P = 0.003). TC did not increase the number of hospital consultations (P = 0.684) and reduced the number of journeys of more than 8h (P = 0.007).

Conclusion: Telemedicine follow-up by stoma nurses did not improve the QoL of patients, but decreased the readmission rate and burden of travel. Registration number NCT01600508 (https://www.clinicaltrials.gov).

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Introduction

There have been considerable advances in the implementation of telemedicine and the development of technology. Telemedicine applications are continually emerging to new areas, such as surgical telementoring, emergency medicine collaboration, education of medical personnel, multidisciplinary team meetings and postoperative follow-up. Postoperative follow-up by teleconsultation (TC) has the potential to improve care, and the technology has become user-friendly.

Patients with a new stoma need time and support with quality of life (QoL) alterations. Some have long and time-consuming travel to the hospital to attend follow-up consultations. TC is well suited to this patient group. In Norway, a fibreoptic network, the Norwegian Healthcare Network, connects TC studios at district medical centres with hospitals. This network provides a high definition and safe solution, enabling high-quality telemedicine communication between primary care and hospitals.

The objective of this study was to obtain insight into the QoL of patients with a stoma, followed up in a hospital outpatient setting (controls) or by teleconsultation (intervention). Healthcare resource use, organization and patient satisfaction with the health service provided was assessed.

Methods

Patients were randomized to follow-up at the university hospital outpatient clinic (control group) or by TC (intervention group). All patients were followed up for...
more than 12 months after surgery. The trial was registered at ClinicalTrials.gov (https://clinicaltrials.gov/ct2/show/NCT01600508).

Patients

Patients with a postsurgical stoma (ileostomy or colostomy) were candidates for inclusion in the study. All patients provided informed consent. Patients were excluded if they had a life expectancy of less than 2 years, mental illness or severe dementia, were unable to provide informed consent, or had stoma formation after palliative surgery (patients with disseminated cancer).

Ethics and consent procedure

The Regional Committee for Medical Research Ethics, University of Oslo, approved the protocol (reference 2009/1432a). The Norwegian Data Inspectorate also approved the study. Patients provided written consent before entering the trial, which was performed according to the Helsinki Declaration and Good Clinical Practice.

Eligibility

All patients who had a new stoma and fulfilled the inclusion criteria were eligible for inclusion in the study. Eligibility was assessed in the immediate postoperative period. The investigators explained the nature, purpose and risks of the study to the participant, who was given an information sheet explaining the study rationale. Participants had sufficient time to read the information and consider any implications. Before signing the informed consent, any questions relating to the study were discussed.

Role of stoma nurses

Nurses with a specialization in wound and stoma care performed follow-up consultations in both trial arms. A nurse-led TC stoma and wound school was established before the clinical trial; nurses with special training in the treatment of patients with wound and stoma problems developed the curriculum. Ten nurses from TC communities all over Northern Norway were recruited. These nurses were responsible for the practical arrangements of
the TC at the district medical centre (DMC). The stoma nurses were affiliated to the DMCs where the TC studios were located. Stoma nurses in both trial arms consulted gastrointestinal surgeons when necessary. Guidelines for safety monitoring were developed. Patients allocated to TC follow-up could be referred back to the university hospital at any time.

**Intervention arm**

Patients received a baseline consultation 0–3 months after the initial surgery. A clinical examination was performed and information about the RCT provided. When patients had provided informed consent, they were randomized by the stoma nurses. Those randomized to TC follow-up were referred to their general practitioner and the local stoma nurse at the DMC. Stoma nurses organized TC at 0–3 (defined as baseline), 6, 9 and more than 12 months. Patients could withdraw from the study and be referred back to hospital follow-up at any time.

**Control arm**

The control group consisted of patients randomized to regular stoma follow-up at the hospital’s surgical outpatient clinic. Consultants in gastrointestinal surgery or a wound and stoma nurse performed the hospital follow-up.

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**Telemedicine studios**

The Cisco® TelePresence system (Cisco Systems, San Jose, California, USA) (screen at DMC: Tandberg 990MXP; screen at hospital: Tandberg 1500MXP) (Cisco Systems) and the Norwegian Healthcare Network fibre-optic cable were used for secure data transmission (Fig. I). The telemedicine studios were located at the university hospital (Tromsø, Norway) and at the DMCs (Finnsnes, Storslett, Vadsø, Lakselv and Alta). Before the trial started, the stoma nurses received intensive training in the use and troubleshooting of the TC equipment.
Table 1 Demographics

|                        | Hospital follow-up (n = 58) | Teleconsultation follow-up (n = 52) | Total (n = 110) |
|------------------------|-------------------------------|-------------------------------------|-----------------|
| **Age (years)***       | 59 ± 3 (16 ± 3)               | 65 ± 5 (12 ± 9)                     | 61 ± 9 (15 ± 2)  |
| **Sex ratio (M:F)**    | 31 : 27                       | 24 : 28                             | 55 : 55         |
| **Length of education** (years)* | 4.6 ± 3.7                   | 4.0 ± 3.3                           | 4.4 ± 3.5       |
| **Native language**    | Norwegian                     |                                     | Norwegian       |
| **Diagnosis**          | Colorectal cancer 22 (38)    | 19 (37)                             | 41 (37 ± 3)     |
|                        | Diverticulitis 16 (28)       | 14 (27)                             | 30 (27 ± 3)     |
|                        | IBD 20 (34)                  | 19 (37)                             | 39 (35 ± 5)     |
| **Type of stoma**      | Colostomy 23 (40)            | 20 (38)                             | 43 (39 ± 1)     |
|                        | Ileostomy 35 (60)            | 32 (62)                             | 67 (60 ± 9)     |
| **Employment status**  | Employed 6 (10)              | 6 (12)                              | 12 (10 ± 9)     |
|                        | Student 1 (2)                | 0 (0)                               | 1 (0 ± 9)       |
|                        | Taking sick leave 10 (17)    | 5 (10)                              | 15 (13 ± 6)     |
|                        | Pensioner 19 (33)            | 20 (38)                             | 39 (35 ± 5)     |
|                        | Receiving social security    | 13 (22)                             | 6 (11)          |
|                        | Missing 9 (16)               | 15 (29)                             | 24 (21 ± 8)     |

Values in parentheses are percentages unless indicated otherwise; *values are mean(s.d.). IBD, inflammatory bowel disease.

Randomization

Randomization was done at the baseline consultation. Once the stoma nurses had confirmed eligibility, an independent organizational unit at the University Hospital Research Department performed web-based randomization. Patients were stratified for age, sex and type of stoma (ileostomy versus colostomy). The randomization ratio was 1 : 1, and there was no block randomization or blinding of participants.

Objectives

The aim of the RCT was to compare QoL and resource use in patients with a stoma followed up by TC or in the surgical outpatient clinic. It was hypothesized that patients in the TC arm would experience moderate improvement (0.3–0.4) in QoL measured by the index score of the 3-level version of the EQ-5D™ questionnaire (EuroQol Group, Rotterdam, the Netherlands). Patient satisfaction and resource use with the telemedicine service were assessed.

Outcome measures

**Primary outcome**

EQ-5D™ is a standardized, generic instrument for use as a measure of health outcome. Applicable to a wide range of health conditions and treatments, it provides a simple descriptive profile and a single index value for health status. The EQ-5D™ measures five dimensions of health-related QoL: mobility, self-care, usual activities, pain/discomfort and anxiety/depression. Each dimension is rated at three levels: no problems (1), some problems (2) and major problems (3)\(^ {10} \).

**Secondary outcomes**

The EQ visual analogue scale (EQ-5D™-VAS) records the respondent’s self-rated health status on a vertically graduated (0–100) VAS\(^ {10} \).

**Stoma Quality-of-Life Scale**

This is a 21-item questionnaire with three scales: Work/Social Function (6 items), Sexuality/Body Image (5 items) and Stoma Function (6 items)\(^ {9} \).

**OutPatient Experiences Questionnaire**

The Norwegian OutPatient Experiences Questionnaire (OPEQ), evaluated by Garratt and colleagues\(^ {11} \), is recommended for measuring patient experience in outpatient clinics\(^ {12} \). Questions in the OPEQ relate to information on future complaints, nursing services, communication, information on examinations, contact with next-of-kin,
doctor services, hospital and equipment, information on medication, and organization and general satisfaction\textsuperscript{12}. Some questions were modified for a telemedicine setting.

**Resource use**

Resources assessed were the number of journeys to the hospital outpatient clinic, DMC, journey time, number of hospital consultations, readmissions and methods of transportation.

**Follow-up schedule**

Parallel follow-up programmes and patient rescheduling of preplanned appointments led to a pragmatic adjustment of the follow-up protocol. Before the trial nine appointments were planned at 1, 3, 6, 9, 12, 15, 18, 21 and 24 months, whereas after commencement of the trial four appointments were decided on, at 0–3, 6, 9 and more than 12 months.

**Data gathering**

A questionnaire was designed for the trial, combining all elements of the scales and questionnaires. Data were collected for patients in the intervention and control groups in identical ways. Stoma nurses received the completed questionnaires immediately after each follow-up appointment. In some instances, patients returned the completed questionnaires by mail. In the case of missing questionnaires, patients were contacted by phone. The questionnaires were optically readable, and the data were collected consecutively in a trial database. In addition to the questionnaire, demographic data were obtained from the electronic medical record and the prospective trial database.

**Sample size**

Sample size calculation was done according to the guidelines of Campbell et al.\textsuperscript{13} and the EQ-5D\textsuperscript{TM} 14. Improvements in $\alpha$ and $\beta$ were set at 0.05 and 0.2 respectively, and tests were two-sided. It was hypothesized that patients followed up by TC would have a moderate increase ($0.3-0.4$) in EQ-5D\textsuperscript{TM} index score. As the standard deviation for patients with a stoma is not estimated for EQ-5D\textsuperscript{TM}, it was assumed that the standard deviation range was 0.18–0.2\textsuperscript{14}. To detect a moderate increase in QoL with this range, a sample size of approximately 100 patients was required. Allowing for a dropout rate of 10 per cent, 110 patients would need to be recruited. Similar estimates were calculated for the EQ-5D\textsuperscript{TM}-VAS.

**Statistical analysis**

The intention-to-treat principle was used to analyse the data. The statistical analysis, including adjustment for co-variables, complied with the CONSORT statement\textsuperscript{15}. Treatment arms were compared with respect to potential co-variables: continuous variables were compared with the independent samples $t$ test and ANOVA, and categorical variables were compared using the $\chi^2$ test or Fisher's exact test.

Responses to the five EQ-5D\textsuperscript{TM} dimensions (for example 1, 1, 2, 1, 3) were converted into utility (index) scores. Preferences (SPSS\textsuperscript{®} syntax imputation) from a UK population were used, as no similar Norwegian preferences exist\textsuperscript{16}. These calculated index scores were then used in the main analyses. The presence of any significant differences in QoL outcome measures (EQ-5D\textsuperscript{TM} index and VAS scores) between baseline and 6, 9 and more than 12 months was determined. A general linear model was employed, and hospital versus intervention group were predictors in analyses of variance (between-groups ANOVA). EQ-5D\textsuperscript{TM} index scores derived at baseline, 6, 9 and more than 12 months were compared in the model.

The OPEQ consists of ten rating scales based on factor analysis\textsuperscript{11,12}. The questionnaire responses to ‘yes’, ‘no’ and ‘I don’t know’ were dichotomized, and compared with the $\chi^2$ or Fisher’s exact test as appropriate.

For analysis of the Stoma Quality-of-Life Questionnaire, the scales (Work/Social Function, Sexuality/Body Image and Stoma Function) were scored according to the algorithm of Baxter and colleagues\textsuperscript{9}. The scores for hospital and TC arms at baseline, 6, 9 and more than 12 months were then compared using between-groups ANOVA.

Missing data were treated as missing. Results for continuous outcomes were expressed as mean values with corresponding standard deviations, 95 per cent c.i. and associated $P$ values. Two-sided $P$ values are reported for all analyses; $P<0.050$ was considered significant. Data were analysed with Excel\textsuperscript{®} (Microsoft, Redmond, Washington, USA) and IBM SPSS\textsuperscript{®} version 25.0 (IBM, Armonk, New York, USA).

**Results**

One university hospital and five DMCs with designated TC studios participated in the study. The mean distance from the DMC to the university hospital was 375 km. The trial lasted until all enrolled patients had been followed for at least 12 months (from 2 February 2011 to 25 May 2016). Of 310 eligible patients with a stoma, 110 were included (58 in the hospital arm versus 52 in the TC arm) (Fig. 2).
Table 2 EuroQol-5D generic quality-of-life comparison

|                      | Hospital follow-up (n = 58) | Teleconsultation follow-up (n = 52) | P† |
|----------------------|-----------------------------|------------------------------------|-----|
| No. of responders    | 49                          | 45                                 | 38  |
| Mobility*            | 20 (41)                     | 14 (31)                            | 11 (22) | 14 (37) | 10 (27) | 7 (16) | 7 (23) | 7 (27) | 0.880 |
| % improvement        | -4                          | 0                                  |     |
| Self-care*           | 7 (14)                      | 7 (16)                             | 7 (14) | 7 (18)  | 5 (14)  | 2 (6)  | 4 (13) | 2 (8)  | 0.825 |
| % improvement        | 4                           | 0                                  |     |
| Usual activities*    | 29 (59)                     | 23 (51)                            | 16 (33) | 20 (53) | 19 (51) | 11 (35) | 13 (42) | 9 (35) | 0.647 |
| % improvement        | -6                          | -16                                |     |
| Pain/discomfort*     | 30 (61)                     | 23 (51)                            | 17 (35) | 19 (50) | 15 (41) | 13 (42) | 15 (48) | 11 (42) | 0.667 |
| % improvement        | -11                         | 1                                  |     |
| Anxiety*             | 18 (37)                     | 13 (29)                            | 9 (18) | 16 (42) | 13 (35) | 10 (32) | 15 (48) | 9 (35) | 0.272 |
| % improvement        | 5                           | 0                                  |     |

*Values are numbers of patients reporting no problems; values in parentheses are percentages. †χ² or Fisher’s exact test.

Figure 4 EQ-5D™ visual analogue scale scores for hospital versus teleconsultation follow-up

Figure 5 Stoma Quality-of-Life Scale Work/Social Function scores for hospital versus teleconsultation follow-up

Twenty-three patients in the hospital group had an end colostomy compared with 20 in the TC group, and 35 and 32 patients respectively had an ileostomy. The trial generated 246 consultations (151 in the hospital arm and 95 in the TC arm), and 306 questionnaires were filled out (181 and 125 respectively). The mean age of patients in the hospital group was 59.3 years, compared with 65.5 years in the TC group, and 50.0 per cent of patients were men. Forty-one of the 110 patients (37.3 per cent) had surgery for colorectal cancer, 30 (27.3 per cent) for diverticulitis, and 39 (35.5 per cent) for inflammatory bowel disease (Table 1).

Eleven patients died during follow-up (7 in the hospital group versus 4 in the TC arm; P = 0.534), and 17 patients had reversal of the stoma (8 versus 9 respectively; P = 0.610). There were no identified adverse events in either group.

EQ-5D™ scores

There were no significant differences between the two groups with respect to the primary outcome, as determined by the EQ-5D™ index score (P = 0.301) (Fig. 3). Similarly, there were no significant differences for the domains of Mobility (P = 0.880), Self-care (P = 0.825),
Table 3  Stoma Quality-of-Life Scale comparison

|                | Hospital follow-up (n = 58) | Teleconsultation follow-up (n = 52) | Total (n = 110) | P*  |
|----------------|-----------------------------|------------------------------------|-----------------|-----|
| Sexuality/Body Image | 44.2 ± 15 (15–80)          | 46.5 ± 17.3 (10–80)                | 45.1 ± 16.3 (10–80) | 0.253 |
| Stoma Function       | 58.1 ± 14.4 (20–91)        | 54.8 ± 16.4 (16–83)                | 56.8 ± 15.3 (16–91) | 0.074 |

Values are mean(s.d.) (range). *Independent samples t test.

Table 4  Comparison of resource use

| Response                  | Hospital follow-up (n = 58) | Teleconsultation follow-up (n = 52) | Total (n = 110) | P‡  |
|---------------------------|-----------------------------|------------------------------------|-----------------|-----|
| No. of healthcare contacts* in last 6 months |                           |                                    |                 |     |
| 1–2                       | No                          | 71 (61.2)                          | 45 (38.8)       | 116  | 0.684 |
|                           | Yes                         | 81 (58.7)                          | 57 (41.3)       | 139  | 0.761 |
| ≥ 3                      | No                          | 82 (59.0)                          | 57 (41.0)       | 139  |           |
|                           | Yes                         | 70 (60.9)                          | 45 (39.1)       | 115  |           |
| Travel time to follow-up (h) |                           |                                    |                 |     |
| 4                         | No                          | 102 (58.3)                         | 73 (41.7)       | 175  | 0.909 |
|                           | Yes                         | 49 (59)                            | 34 (41)         | 83   |           |
| 8                         | No                          | 130 (55.8)                         | 103 (44.2)      | 233  | 0.007 |
|                           | Yes                         | 21 (84)                            | 4 (16)          | 25   |           |
| Transportation†           |                           |                                    |                 |     |
| Plane                     | No                          | 126 (56.3)                         | 98 (43.8)       | 224  | 0.288 |
|                           | Yes                         | 45 (63)                            | 26 (37)         | 71   |           |
| Ferry                     | No                          | 152 (55.9)                         | 120 (44.1)      | 272  | 0.012 |
|                           | Yes                         | 19 (83)                            | 4 (17)          | 23   |           |
| Bus                       | No                          | 133 (56.1)                         | 104 (43.9)      | 237  | 0.193 |
|                           | Yes                         | 38 (66)                            | 20 (34)         | 58   |           |
| Taxi                      | No                          | 133 (58.8)                         | 93 (41.2)       | 226  | 0.577 |
|                           | Yes                         | 38 (55)                            | 31 (45)         | 69   |           |
| Car                       | No                          | 110 (62.9)                         | 65 (37.1)       | 175  | 0.039 |
|                           | Yes                         | 61 (50.8)                          | 59 (49.2)       | 120  |           |
| Need for overnight stay   | Hotel                       | 129 (57.1)                         | 97 (42.9)       | 226  | 0.068 |
|                           | Yes                         | 25 (74)                            | 9 (26)          | 34   |           |

Values in parentheses are row percentages. *Hospital appointments and readmissions. †More than one modality possible to reach follow-up appointment. ‡χ² or Fisher’s exact test.

Usual activities (P = 0.647), Pain/discomfort (P = 0.667) and Anxiety (P = 0.272) (Table 2). EQ-5D™-VAS scores were also similar in the two groups (P = 0.775) (Fig. 4).

Stoma Quality-of-Life Scale

There were no significant differences on the designated Stoma Quality-of-Life Scale: Work/Social Function (P = 0.822), Sexuality/Body Image (P = 0.253) and Stoma Function (P = 0.074) (Fig. 5 and Table 3).

Resource use

There were no significant differences in the number of hospital appointment or readmissions (P = 0.684). For mode of transportation, significantly more patients in the hospital group used car (P = 0.039) and ferry (P = 0.012), and significantly more patients in the hospital group had a journey time of more than 8 h (P = 0.007) (Table 4).

Outpatient experiences

The hospital group performed significantly better for items relating to organization of care (staff collaboration, P = 0.004; met same persons, P = 0.003) and communication (surgeon understandable, P < 0.001; surgeon competent, P = 0.005). Overall, there were no significant differences in the experience of hospital versus TC consultation (P = 1.000), and most patients in the TC group...
# Table 5 OutPatient Experiences Questionnaire comparison

| Table 5 OutPatient Experiences Questionnaire comparison | Hospital follow-up \((n = 58)\) | Teleconference follow-up \((n = 52)\) | Total \((n = 110)\) | \(P^*\) |
|---------------------------------------------------------|---------------------------------|---------------------------------|--------------------|-------|
| **Clinical access**                                      |                                 |                                 |                    |       |
| Ease of finding clinic/ward                              |                                 |                                 |                    |       |
| No                                                      | 19 (61)                         | 12 (39)                         | 31                 | 0.806 |
| Yes                                                     | 134 (59.0)                      | 93 (41.0)                       | 227                |       |
| **Quality of communication**                            |                                 |                                 |                    |       |
| Enough time for dialogue                                 |                                 |                                 |                    |       |
| No                                                      | 11 (73)                         | 4 (27)                          | 15                 | 0.240 |
| Yes                                                     | 142 (58.0)                      | 103 (42.0)                      | 245                |       |
| Surgeon understandable                                  |                                 |                                 |                    |       |
| No                                                      | 56 (49.1)                       | 58 (50.9)                       | 114                | <0.001|
| Yes                                                     | 78 (71.6)                       | 31 (28.4)                       | 109                |       |
| Hospital nurse understandable                            |                                 |                                 |                    |       |
| No                                                      | 4 (33)                          | 8 (67)                          | 12                 | 0.046 |
| Yes                                                     | 146 (62.1)                      | 89 (37.9)                       | 235                |       |
| Surgeon competent                                        |                                 |                                 |                    |       |
| No                                                      | 65 (52.8)                       | 58 (47.2)                       | 123                | 0.005 |
| Yes                                                     | 69 (71)                         | 28 (29)                         | 97                 |       |
| Hospital nurse competent                                 |                                 |                                 |                    |       |
| No                                                      | 14 (58)                         | 10 (42)                         | 24                 | 0.841 |
| Yes                                                     | 136 (60.4)                      | 89 (39.6)                       | 225                |       |
| Surgeon caring                                           |                                 |                                 |                    |       |
| No                                                      | 59 (51.8)                       | 55 (48.2)                       | 114                | 0.003 |
| Yes                                                     | 75 (70.8)                       | 31 (29.2)                       | 106                |       |
| Hospital nurse caring                                    |                                 |                                 |                    |       |
| No                                                      | 6 (46)                          | 7 (54)                          | 13                 | 0.285 |
| Yes                                                     | 144 (61.0)                      | 92 (39.0)                       | 236                |       |
| Opportunity to give sufficient information               |                                 |                                 |                    |       |
| No                                                      | 37 (51)                         | 35 (49)                         | 72                 | 0.147 |
| Yes                                                     | 114 (61.3)                      | 72 (38.7)                       | 186                |       |
| Left with unanswered questions                           |                                 |                                 |                    |       |
| No                                                      | 13 (43)                         | 17 (57)                         | 30                 | 0.068 |
| Yes                                                     | 138 (60.8)                      | 89 (39.2)                       | 227                |       |
| **Organization**                                         |                                 |                                 |                    |       |
| Background information available                         |                                 |                                 |                    |       |
| No                                                      | 37 (51)                         | 35 (49)                         | 72                 | 0.147 |
| Yes                                                     | 114 (61.3)                      | 72 (38.7)                       | 186                |       |
| Staff collaboration good                                 |                                 |                                 |                    |       |
| No                                                      | 12 (36)                         | 21 (64)                         | 33                 | 0.004 |
| Yes                                                     | 143 (62.2)                      | 87 (37.8)                       | 230                |       |
| Met same persons                                         |                                 |                                 |                    |       |
| No                                                      | 45 (48)                         | 48 (52)                         | 93                 | 0.003 |
| Yes                                                     | 107 (67.3)                      | 52 (32.7)                       | 159                |       |
| Hospital nurse well prepared                             |                                 |                                 |                    |       |
| No                                                      | 13 (48)                         | 14 (52)                         | 27                 | 0.153 |
| Yes                                                     | 136 (62.4)                      | 82 (37.6)                       | 218                |       |
| Surgeon well prepared                                    |                                 |                                 |                    |       |
| No                                                      | 66 (51.2)                       | 63 (48.8)                       | 129                | 0.002 |
| Yes                                                     | 70 (71)                         | 28 (29)                         | 98                 |       |
| Surgeon missing                                          |                                 |                                 |                    |       |
| No                                                      | 84 (65.6)                       | 44 (34.4)                       | 128                | 0.045 |
| Yes                                                     | 52 (53)                         | 47 (47)                         | 99                 |       |
| **Quality of information**                               |                                 |                                 |                    |       |
| Self-care                                                |                                 |                                 |                    |       |
| No                                                      | 26 (44)                         | 33 (56)                         | 59                 | 0.029 |
| Yes                                                     | 126 (60.0)                      | 84 (40.0)                       | 210                |       |
| Condition/prognosis                                      |                                 |                                 |                    |       |
| No                                                      | 61 (49.2)                       | 63 (50.8)                       | 124                | 0.001 |
| Yes                                                     | 89 (69.5)                       | 39 (30.5)                       | 128                |       |
| Consulted about examination/treatment                    |                                 |                                 |                    |       |
| No                                                      | 64 (55.2)                       | 52 (44.8)                       | 116                | 0.111 |
| Yes                                                     | 84 (65.1)                       | 45 (34.9)                       | 129                |       |
| **Quality of previsit communication**                    |                                 |                                 |                    |       |
| Acceptable appointment waiting time                      |                                 |                                 |                    |       |
| No                                                      | 26 (62)                         | 16 (38)                         | 42                 | 0.708 |
| Yes                                                     | 127 (58.8)                      | 89 (41.2)                       | 216                |       |
| **Overall satisfaction**                                 |                                 |                                 |                    |       |
| Do you wish to attend a future TC consultation?          |                                 |                                 |                    |       |
| No                                                      | 125 (74.9)                      | 42 (25.1)                       | 167                | <0.001|
| Yes                                                     | 45 (35.4)                       | 82 (64.6)                       | 127                |       |
| Good overall experience                                  |                                 |                                 |                    |       |
| No                                                      | 3 (60)                          | 2 (40)                          | 5                  | 1.000 |
| Yes                                                     | 149 (59.1)                      | 103 (40.9)                      | 252                |       |

Values in parentheses are row percentages. TC, teleconsultation. \(\chi^2\) or Fisher’s exact test.

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chose TC over hospital follow-up as their next consultation option \( (P < 0.001) \) (Table 5).

**Discussion**

TC follow-up did not generate more hospital consultations and decreased patients’ journey time significantly. There is, however, considerable room for improvement in TC organization and communication. Communication between healthcare providers participating in the TC arm showed a considerable quality gap, highlighting that communication during TC is challenging.

Internationally, TC is used as an instrument for follow-up of patients in the postoperative period and for outpatient consultation. Norway has experience with TC in haemodialysis, dermatology, orthopaedics and neurology\(^ {17–19} \). Noteworthy is a recent randomized trial\(^ {17,20} \) in which patients were examined by a district orthopaedic nurse under the supervision of an orthopaedic consultant located at the university hospital. There were no adverse events, and the TC service was cost-effective\(^ {17,20} \). Nikolian and co-workers\(^ {21} \) established an eClinic for patients undergoing cholecystectomy, appendicectomy or inguinal hernia repair. The eClinic was easily accessed by patients in the postoperative period, and led to an increase in QoL and reduced costs, compared with traditional outpatient follow-up appointments.

Wallace et al.\(^ {22} \) compared joint TC between general practitioners, specialists (surgeons) and patients with the standard outpatient referral. They found that allocation of patients to virtual outreach consultations was associated with increased offers of follow-up appointments. However, it resulted in significantly increased patient satisfaction, and reduced tests and investigations. Efficient operation of such services will require appropriate selection of patients, considerable service reorganization, and the provision of logistical support.

TC can be used in almost any medical specialty, although best suited are those with a consultation that requires a high visual component. Stoma healing and wound management are thus prime candidates for TC follow-up. Development of suitable telemedicine systems in these fields could have a significant effect on wound care in the community, tertiary referral patterns and hospital admission rates\(^ {23,24} \). TC in the surgical community has helped to deliver better care, especially in rural areas\(^ {25} \).

During the 7 years of this study, video-conferencing technology has evolved to be more user-friendly. Technological difficulties may have impacted the results of the OPEQ study\(^ {11} \). More dropouts were observed in the TC group (26 versus 20 patients in the control group), and some withdrew from the study. Reasons for withdrawal were that patients felt they did not need follow-up (many were participating in parallel follow-up programmes after curative surgery for cancer)\(^ {25} \). Finally, the Stoma Quality-of-Life Questionnaire has not been translated into Norwegian, and the trial group did the translation. This may have impacted interpretation of the questions and be a potential source of bias. The strength of the study is the randomized study design, providing high-quality data on a scientific topic with limited evidence.

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