Patients’ use of digital audio recordings in four different outpatient clinics

MAIKEN WOLDERSLUND1,2, POUL-ERIK KOFOED2,3, RENÉ HOLST2, and JETTE AMMENTORP1,2

1Health Services Research Unit, Lillebaelt Hospital, Vejle, Denmark, 2Institute of Regional Health Research, Faculty of Health Sciences, University of Southern Denmark, Odense, Denmark, and 3Department of Paediatrics, Lillebaelt Hospital, Kolding, Denmark

Address reprint requests to: Maiken Wolderslund, Health Services Research Unit, Lillebaelt Hospital, Kabbeltoft 25, Bygning S100, Vejle DK-7100, Denmark. Tel: +45-2762-6734; Fax: +45-7940-6960; E-mail: Maiken.Wolderslund@rsyd.dk

Accepted 26 August 2015

Abstract

Objective: To investigate a new technology of digital audio recording (DAR) of health consultations to provide knowledge about patients’ use and evaluation of this recording method.

Design: A cross-sectional feasibility analysis of the intervention using log data from the recording platform and data from a patient-administered questionnaire.

Setting: Four different outpatient clinics at a Danish hospital: Paediatrics, Orthopaedics, Internal Medicine and Urology.

Participants: Two thousand seven hundred and eighty-four outpatients having their consultation audio recorded by one of 49 participating health professionals.

Intervention: DAR of outpatient consultations provided to patients permitting replay of their consultation either alone or together with their relatives.

Main Outcome Measure: Replay of the consultation within 90 days from the consultation.

Results: In the adult outpatient clinics, one in every three consultations was replayed; however, the rates were significantly lower in the paediatric clinic where one in five consultations was replayed. The usage of the audio recordings was positively associated with increasing patient age and first time visits to the clinic. Patient gender influenced replays in different ways; for instance, relatives to male patients replayed recordings more often than relatives to female patients did. Approval of future recordings was high among the patients who replayed the consultation.

Conclusion: Patients found that recording health consultations was an important information aid, and the digital recording technology was found to be feasible in routine practice.

Key words: audio recordings, outpatients, technology, patient–provider communication, patient safety, quality improvement

Introduction

The impact of providing patients with audio recordings of their health consultations has been explored in recent decades, primarily in cancer settings. Across studies, the majority of cancer patients value these recordings as an aid to repeat information [1, 2] and inform their relatives [1, 3–5]. A Cochrane review from 2008 [6] as well as a recent review from 2014 reflects these findings; an average of 72% of patients listened to the audiotape at least once [7], and in most cases, the recording was shared with others [1, 5, 8–13]. Furthermore, audio recordings seem to have a positive effect on patients’ satisfaction [1, 5, 9, 10, 14], participation [5, 11] and understanding and recall of information [3–5, 9, 15, 16], although not all studies have supported these findings [4, 10–14]. Few studies have focused on settings other than oncology. Still, evidence exists that patients benefit from recording consultations.
regardless of clinical setting [17–20]. Moreover, previous studies have mainly focused on ‘bad news’ consultations in which the information is distressing [3–5, 10, 11, 14, 15, 21], rather than on general consultations where the information could be reassuring and comfort patients or evoke no emotions. Thus, it remains unclear whether patients receiving general consultations would use the audio recording if it was offered.

In addition, little attention has been devoted to examining whether the use of audio recordings is associated with different patient characteristics. Nevertheless, such knowledge is crucial to target future audio recordings to specific patient groups in a broader clinical setting.

Another fundamental aspect of the implementation process is the usability of the specific audio recording method and procedures in clinical settings. The majority of consultation recordings have previously been on audiotapes. Audiotapes are not only an outdated technology but also require additional and adequate equipment for both the health professionals when recording and the patients when replaying. Furthermore, audiotapes are vulnerable in terms of data security and risk damage to the tape itself. Little is known about the utilization of modern recording technology, although two recent studies have explored the use of a USB stick [5] and a CD [22]. However, these methods still assume that patients have access to a computer and have the skills to replay the device.

Consequently, there are some requirements for recordings of consultations to be successful. The technology should offer high data safety, be user friendly for both patients and health professionals and correspond to limitations in the clinical setting where time efficiency is inevitable.

The main purpose of this study is to provide knowledge about patients’ use and evaluation of a new technology involving digital audio recording (DAR) of consultations in four different outpatient clinics. In addition, associations between the use of the audio recordings and different patient and consultation characteristics are explored.

Methods
Study design
A cross-sectional analysis based on 2784 patients receiving DAR as part of a three-armed randomized controlled trial. Patients in the first intervention arm were provided with DAR, whereas patients in the second intervention arm were mailed a question-prompt list prior to the consultation, as a supplement to DAR. The third arm comprised the control group receiving standard care.

Sample
The following four outpatient clinics at a Danish regional hospital participated in the study: Paediatrics, Urology, Orthopaedics and Internal Medicine. At each clinic, the department head selected a number of health professionals to record their consultations. The doctors (n = 32) were either chief physicians/surgeons or staff specialists, and the nurses (n = 17) had independent consultations. Patients were included consecutively if they consented to participate. The following exclusion criteria were used: (i) age <18 years (with the exception of the paediatric outpatient clinic), (ii) lack of a Danish social security number, (iii) telephone consultation, (iv) hospital admission, (v) impaired hearing and (vi) inability to comprehend information about the study. The median number of patients included per health professional was 89 (range: 3–317). This wide range reflects both unforeseen shifts in employment and the fact that recordings were conducted in routine practice. Patients were included in the study between February 2011 and January 2012.

DAR and replay procedure
To facilitate the implementation process, consultations were recorded using a wireless telephone (Ascom 9d24 MkII Medic) already used at the outpatient clinics at Lillebaelt Hospital. An interactive voice response (IVR) platform was established enabling recording and digital storage. To ensure better audio quality, the microphone in each telephone was adjusted to a higher sensitivity level. Health professionals initiated the audio recording by calling a dedicated number and entering the patient’s social security number at which point the IVR platform generated a PIN code. A feature in the platform allowed the health professionals to pause the recordings if necessary or as requested by the patients; otherwise, the entire consultation was recorded. Patients were provided with an information leaflet containing their PIN code and replay instructions. A replay was available on any telephone by entering the social security number along with the PIN code.

Measurements
All of the information about recordings and consultation replays was obtained from the IVR platform. Patients’ characteristics and evaluations of the digital recording were obtained from a survey using the questionnaire ‘The Use and Effect of Digital Audio Recording’ (UsE-DAR) developed for the randomized controlled trial (RCT). The questionnaire contained the following 15 items: 7 items regarding the use of the audio recording measured on a categorical scale; 7 items on the effect of replaying the consultation measured on a 5-point Likert scale ranging from high disagreement to high agreement and finally 1 item about the future provision of DARs measured on the same Likert scale. All questionnaire data were double entered and verified using EpiData version 3.1.

Statistical methods
Statistical analyses using χ2 and Mann–Whitney tests were performed to confirm a successful randomization procedure. No statistically significant differences were found between the two intervention groups regarding patient and consultation characteristics (Table 1). Consequently, these groups were joined for analysis purposes. However, the paediatric outpatient clinic was found to be incomparable with the three adult clinics and consequently analysed separately.

The percentages of missing data in the questionnaire ranged from 1 to 13% with an arbitrary missing data pattern [23] and most likely missing at random. Given these findings, multiple imputation by chained equation with 25 imputations [24] was conducted on four variables with 1.5–5.6% missing values.

A mixed-effect model was used to allow for potential cluster effects formed by each patient being assigned to one of the 49 health professionals, who were nested in the four outpatient clinics [25]. Analysis revealed that the cluster effect of the outpatient clinics was negligible (SD = 5.85e−09) and consequently omitted from all analyses. The main response variable was binary (replay: yes/no), and analyses were performed using a random intercept logistic regression model. A multinomial logistic regression was used to analyse the categorical response. Incorporating the cluster structure in this analysis was not possible in the statistical package.

All potential covariates (see Table 1) were included in both models with stepwise removal of insignificant covariates starting with those presenting with the highest P-value. To investigate possible associations between replay and different background variables, the
frequency varied greatly among the outpatient clinics. In particular, the

returned and consequently treated as not replayed. The replay fre-

more, 26 consultations were replayed after the questionnaire was

9.7

median: 159 days after the consultation, range: 97–26.5, SD = 6.8–13.1).

The use of the DAR

Of the 2784 recorded consultations, 31% (n = 856) were replayed by

the patient, relatives or a combination of the two within 90 days of the

consultation. Nineteen additional consultations were replayed later

(median: 159 days after the consultation, range: 97–319). Furthermore,

26 consultations were replayed after the questionnaire was

returned and consequently treated as not replayed. The replay fre-

quency varied greatly among the outpatient clinics. In particular, the

pediatric outpatient clinic differed with a significantly lower replay

frequency than the adult outpatient clinics (Table 2). One in three

consultations was replayed several times.

The time from recording to replay varied only slightly across the

four outpatient clinics. Nearly half of the consultations were replayed

within 24 h from the time of recording (Table 2). Of the 378 consulta-

tions replayed exclusively by the patients, 233 (62%) were replayed

within the first 2 weeks, as were 42 (57%) of the 74 replayed by the

parents. As observed in Table 2, the adult consultations were replayed more

often in their full length than the pediatric consultations, and relatives

participated in the replays more often in the urology clinic. Replays in

the pediatric clinic were most commonly performed by one of the

parents (n = 54), while 19 replays were done by both parents.

Characteristics associated with replay of the consultation

In the paediatric clinic, neither patient characteristics nor consultation

characteristics were associated with the likelihood of replaying the

consultation. Results from the adult clinics showed that patient age

characteristics were associated with the likelihood of replaying the

consultation. Results from the adult clinics showed that patient age

had the strongest association with replaying the consultation (Table 3).

Furthermore, results indicated that patients attending the clinic for the

first time were more likely to replay the consultation. The cluster effect

of the health professional was 8.9% (SD = 0.32, 95%CI = 0.20–0.52).

As observed in Table 4, patient gender and age influenced the prob-

ability of replay, depending on who replayed the consultation. Male pa-

tients and their relatives had a lower probability of replaying together

compared with female patients and their relatives, with the relative

statistical analyses were performed using Stata13 for all tests, and

P-values <0.05 were considered to be statistically significant.

Results

Patient and consultation characteristics

The overall response rate for the two intervention groups was 78% (n/N = 2784/3563). The education level was higher in the parent

group than among the adult patients (Table 1). The majority of

patients across all four outpatient clinics had previously attended the

clinic. Every other patient attending one of the two medical clinics

reported previously seeing the same health professional. For patients

in the two surgical clinics, little more than one in three had previously

seen the same health professional. The length of consultation varied

significantly among the four clinics (range of duration: median = 9.7–24.2 min, mean = 11.1–26.5, SD = 6.8–13.1).

Table 1 Patient and consultation characteristics by outpatient clinic

<table>
<thead>
<tr>
<th></th>
<th>Paediatric (n = 654)</th>
<th>Orthopaedic (n = 704)</th>
<th>Internal medicine (n = 737)</th>
<th>Urology (n = 689)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient age in years, median (IQR)</td>
<td>9 (7)</td>
<td>64 (19)</td>
<td>60 (22)</td>
<td>69 (15)</td>
</tr>
<tr>
<td>Patient gender, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>364 (55.7)</td>
<td>302 (42.9)</td>
<td>326 (44.2)</td>
<td>564 (81.9)</td>
</tr>
<tr>
<td>Female</td>
<td>290 (44.3)</td>
<td>402 (57.1)</td>
<td>411 (55.8)</td>
<td>125 (18.1)</td>
</tr>
<tr>
<td>Education*, n (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ Lower secondary</td>
<td>39 (6.0)</td>
<td>193 (27.4)</td>
<td>196 (26.6)</td>
<td>146 (21.2)</td>
</tr>
<tr>
<td>Upper secondary/vocational training</td>
<td>189 (28.9)</td>
<td>242 (34.4)</td>
<td>231 (31.3)</td>
<td>257 (37.3)</td>
</tr>
<tr>
<td>Short cycle tertiary</td>
<td>91 (13.9)</td>
<td>63 (9.2)</td>
<td>67 (9.1)</td>
<td>57 (8.3)</td>
</tr>
<tr>
<td>Bachelor or equivalent</td>
<td>257 (39.3)</td>
<td>140 (19.9)</td>
<td>144 (19.5)</td>
<td>127 (18.4)</td>
</tr>
<tr>
<td>≥ Master or equivalent</td>
<td>63 (9.6)</td>
<td>38 (5.4)</td>
<td>40 (5.4)</td>
<td>72 (10.5)</td>
</tr>
<tr>
<td>Not reported</td>
<td>15 (2.3)</td>
<td>26 (3.7)</td>
<td>59 (8.0)</td>
<td>30 (4.3)</td>
</tr>
<tr>
<td>Previous consultation in the clinic, n (%)</td>
<td>0</td>
<td>134 (20.5)</td>
<td>151 (21.5)</td>
<td>123 (16.7)</td>
</tr>
<tr>
<td>≥1</td>
<td>514 (78.6)</td>
<td>534 (75.9)</td>
<td>588 (79.8)</td>
<td>527 (76.5)</td>
</tr>
<tr>
<td>Not reported</td>
<td>6 (0.9)</td>
<td>19 (2.7)</td>
<td>26 (3.5)</td>
<td>20 (2.0)</td>
</tr>
<tr>
<td>Previous consultation with the HP, n (%)</td>
<td>Yes</td>
<td>314 (48.0)</td>
<td>256 (36.4)</td>
<td>408 (55.4)</td>
</tr>
<tr>
<td>No</td>
<td>322 (49.1)</td>
<td>412 (58.5)</td>
<td>313 (42.5)</td>
<td>383 (55.6)</td>
</tr>
<tr>
<td>Not reported</td>
<td>19 (2.9)</td>
<td>36 (5.1)</td>
<td>16 (2.2)</td>
<td>48 (7.0)</td>
</tr>
<tr>
<td>Length of consultations in minutes, n (%)</td>
<td>≤5</td>
<td>7 (1.1)</td>
<td>116 (16.5)</td>
<td>35 (4.8)</td>
</tr>
<tr>
<td>&gt;5 to ≤10</td>
<td>32 (4.9)</td>
<td>243 (34.5)</td>
<td>127 (17.2)</td>
<td>187 (27.1)</td>
</tr>
<tr>
<td>&gt;10 to ≤20</td>
<td>200 (30.6)</td>
<td>287 (40.8)</td>
<td>303 (41.1)</td>
<td>315 (45.7)</td>
</tr>
<tr>
<td>&gt;20 to ≤30</td>
<td>186 (28.4)</td>
<td>46 (6.5)</td>
<td>175 (23.7)</td>
<td>101 (14.7)</td>
</tr>
<tr>
<td>&gt;30</td>
<td>229 (35.0)</td>
<td>12 (1.7)</td>
<td>97 (13.2)</td>
<td>22 (3.2)</td>
</tr>
</tbody>
</table>

HP, Health professionals.
*Includes both patients providing their occupation instead of education and missing.
+Includes both ‘do not know’ and missing.

following variables were either categorized or dichotomized: age, edu-

cation level, the number of previous visits and consultation length.

Statistical analyses were performed using Stata13 for all tests, and

P-values <0.05 were considered to be statistically significant.
usually being the patient’s partner. Relatives of male patients had a higher probability of replaying on their own compared with female patients’ relatives. No significant effect of patient gender was found for patients who replayed by themselves. In addition, the chance for replaying vs. no replay rose with increasing patient age. This tendency was most pronounced for patients or relatives replaying on their own.

**Evaluation of the technique and quality when using the DAR**

The patients’ evaluation of the DAR showed that the majority of patients had no difficulty replaying their consultation (Table 5). Comments in the questionnaire indicated that lower satisfaction among parents could be explained by inaudibility of their child’s voice. Similarly, some adult patients reported difficulty hearing their own voice.

---

**Table 2 Participants’ replay of the consultation by outpatient clinic**

<table>
<thead>
<tr>
<th></th>
<th>Paediatric</th>
<th>Orthopaedic</th>
<th>Internal medicine</th>
<th>Urology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultations replayed, a N/N (%)</td>
<td>105/654 (16.1)</td>
<td>254/704 (36.1)</td>
<td>238/737 (32.3)</td>
<td>259/689 (37.6)</td>
</tr>
<tr>
<td>Replay times, n (%)</td>
<td>N = 105</td>
<td>N = 234</td>
<td>N = 238</td>
<td>N = 259</td>
</tr>
<tr>
<td>1</td>
<td>82 (78.1)</td>
<td>196 (77.2)</td>
<td>174 (73.1)</td>
<td>155 (59.9)</td>
</tr>
<tr>
<td>2</td>
<td>18 (17.1)</td>
<td>41 (16.1)</td>
<td>45 (18.9)</td>
<td>77 (29.7)</td>
</tr>
<tr>
<td>≥3</td>
<td>5 (4.8)</td>
<td>17 (6.7)</td>
<td>19 (8.0)</td>
<td>27 (10.4)</td>
</tr>
<tr>
<td>Time from consultation to first replay</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤6 h</td>
<td>22 (21.0)</td>
<td>72 (28.4)</td>
<td>58 (24.4)</td>
<td>68 (26.3)</td>
</tr>
<tr>
<td>&gt;6 to &lt;24 h</td>
<td>17 (16.2)</td>
<td>36 (14.7)</td>
<td>32 (13.5)</td>
<td>47 (18.2)</td>
</tr>
<tr>
<td>1–7 days</td>
<td>24 (22.9)</td>
<td>52 (20.5)</td>
<td>42 (17.7)</td>
<td>52 (20.1)</td>
</tr>
<tr>
<td>8–14 days</td>
<td>6 (5.7)</td>
<td>15 (5.9)</td>
<td>18 (7.6)</td>
<td>13 (5.0)</td>
</tr>
<tr>
<td>&gt;14 days</td>
<td>36 (34.3)</td>
<td>79 (31.1)</td>
<td>88 (37.0)</td>
<td>79 (30.5)</td>
</tr>
<tr>
<td>Proportion replayedb, c</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤0.5</td>
<td>57 (54.3)</td>
<td>46 (18.1)</td>
<td>68 (28.6)</td>
<td>49 (18.9)</td>
</tr>
<tr>
<td>&gt;0.5 to &lt;1</td>
<td>27 (25.7)</td>
<td>78 (30.7)</td>
<td>79 (33.2)</td>
<td>83 (32.1)</td>
</tr>
<tr>
<td>=1</td>
<td>21 (20.0)</td>
<td>130 (51.2)</td>
<td>91 (38.2)</td>
<td>127 (49.0)</td>
</tr>
<tr>
<td>Replayed byd, e</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parentsd/patients</td>
<td>73 (69.5)</td>
<td>139 (54.7)</td>
<td>134 (56.3)</td>
<td>100 (38.6)</td>
</tr>
<tr>
<td>Parentsd/patients and relativesd</td>
<td>23 (21.9)</td>
<td>80 (31.5)</td>
<td>74 (31.1)</td>
<td>116 (44.8)</td>
</tr>
<tr>
<td>Relativesd</td>
<td>4 (3.8)</td>
<td>22 (8.7)</td>
<td>24 (10.1)</td>
<td>36 (13.9)</td>
</tr>
<tr>
<td>Not reported</td>
<td>5 (4.8)</td>
<td>13 (5.1)</td>
<td>6 (2.5)</td>
<td>7 (2.7)</td>
</tr>
</tbody>
</table>

aReplayed within 3 months from the visit in the outpatient clinic and before return of questionnaire.

bAverage based on all replays for each patient.

cBased on survey questions and validated with IVR data.

dIn paediatrics.

eChildren and/or family in paediatrics.

**Table 3 Effect of covariates on adult patients’ replay**

<table>
<thead>
<tr>
<th></th>
<th>n/N = 2130/2130</th>
<th>ORa</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex: Male</td>
<td>Reference</td>
<td>1.26</td>
<td>1.04–1.54</td>
<td>0.020</td>
</tr>
<tr>
<td>Age, years: &lt;50</td>
<td>Reference</td>
<td>1.55</td>
<td>1.13–2.13</td>
<td>0.007</td>
</tr>
<tr>
<td>≥50 to &lt;60</td>
<td>2.09</td>
<td>1.57–2.77</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>≥60 to &lt;70</td>
<td>2.32</td>
<td>2.42–4.28</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>≥70</td>
<td>Reference</td>
<td>0.80</td>
<td>0.63–1.01</td>
<td>0.066</td>
</tr>
</tbody>
</table>

aRandom intercept logistic regression.

bImputed missing data.

---

usually being the patient’s partner. Relatives of male patients had a higher probability of replaying on their own compared with female patients’ relatives. No significant effect of patient gender was found for patients who replayed by themselves. In addition, the chance for replaying vs. no replay rose with increasing patient age. This tendency was most pronounced for patients or relatives replaying on their own.

**Evaluation of the technique and quality when using the DAR**

The patients’ evaluation of the DAR showed that the majority of patients had no difficulty replaying their consultation (Table 5). Comments in the questionnaire indicated that lower satisfaction among parents could be explained by inaudibility of their child’s voice. Similarly, some adult patients reported difficulty hearing their own voice.
Table 5 Evaluation of the DAR technique and quality

<table>
<thead>
<tr>
<th>n/N*</th>
<th>Paediatric, 96/105</th>
<th>Orthopaedic, 219/254</th>
<th>Internal medicine, 208/238</th>
<th>Urology, 216/259</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Evaluation of the technical part, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easy or very easy</td>
<td>73 (76.0)</td>
<td>215 (98.2)</td>
<td>199 (95.7)</td>
<td>208 (96.3)</td>
</tr>
<tr>
<td>Difficult or very difficult</td>
<td>1 (1.0)</td>
<td>3 (1.4)</td>
<td>2 (1.0)</td>
<td>2 (0.9)</td>
</tr>
<tr>
<td>Not reported</td>
<td>22 (22.9)</td>
<td>1 (0.5)</td>
<td>7 (3.4)</td>
<td>6 (2.8)</td>
</tr>
<tr>
<td><strong>Evaluation of the audio quality, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good or very good</td>
<td>34 (35.4)</td>
<td>150 (68.5)</td>
<td>142 (68.3)</td>
<td>147 (68.1)</td>
</tr>
<tr>
<td>Poor or very poor</td>
<td>33 (34.4)</td>
<td>59 (26.9)</td>
<td>56 (26.9)</td>
<td>56 (25.9)</td>
</tr>
<tr>
<td>Not able to hear anything</td>
<td>7 (7.3)</td>
<td>8 (3.7)</td>
<td>4 (1.9)</td>
<td>8 (3.7)</td>
</tr>
<tr>
<td>Not reported</td>
<td>22 (22.9)</td>
<td>2 (0.9)</td>
<td>6 (2.9)</td>
<td>5 (2.3)</td>
</tr>
</tbody>
</table>

*a/N: parents or patients replaying/all replayed consultations.

**Reasons for using or not using the DAR**

Availability of the audio recording was the main motivation for replaying the consultation by 38% of the adult patients (n/N = 243/643) and by 25% of the parents (n/N = 187/74). Twenty-one per cent of the adult patients (n = 132) and 18% of the parents (n = 13) reported ‘difficulties remembering or understanding information from the consultation’, while 15% of the adult patients (n = 98) and 30% of the parents (n = 22) mentioned that ‘sharing the consultation with relatives’ was the reason for replaying the consultation. An additional 159 patients and 17 parents provided multiple or other reasons for their replay, while 11 patients and four parents did not answer the question.

A total of 1928 participants did not replay the consultation, providing ‘no need for replay’ as the most common reason (n = 1260, 65%) and ‘no wish or no time’ as the second most frequent cause (n = 229, 12%). One hundred participants (5%) either ‘lost the information leaflet’ with their PIN code (n = 74), found the replay technique too complicated (n = 21) or ‘experienced a busy IVR platform’ (n = 5). Another 67 participants reported other reasons for not replaying, and 272 participants failed to answer this question.

When asked, 688 of the 836 (80%) patients and parents replaying the consultations wanted future consultations to be recorded compared with 55% (n/N = 1059/1928) of those who did not use the replay option.

**Discussion and conclusion**

**Discussion**

Replay in one in every three adult patient consultations indicates a need for DAR of consultations in a broader setting, which is also stressed by the fact that nearly one in four consultations was replayed because of problems with recall or understanding of the given information. Furthermore, the wish to share the consultation with a partner or other relative was another common reason for replay which is underlined by the high proportion of relatives actually replaying the recording. These results corroborate with findings from the previously largest RCTs conducted by Hack et al. [12, 13], though a few mostly smaller sized RCTs found even higher percentages of sharing [1, 9, 16, 22]. Our findings also indicate that the likelihood of replay rises with increasing patient age, both when replayed by the patient alone and with relatives, indicating that this age group should be considered when designing systems to be used in routine health care.

Male patients did not replay their consultations more often than females. However, we found that female patients twice as often listened to the consultation with a relative as male patients did, whereas relatives of male patients were three times more likely to replay than relatives of female patients. Similar results were found in two studies by Hack et al. where relatives to men with prostate cancer [13] more often replayed compared with relatives to women with breast cancer [12]. This finding could be explained by differences in gender attitudes, with women being more open and wanting to be involved in their husband’s health care as well as wanting them to be involved in their own health care. Furthermore, adult patients attending the clinic for the first time had a greater replay need than patients who had been to the clinics before, probably indicating that they had difficulties in understanding and/or remembering the information given.

The previous research has demonstrated replay rates exceeding more than half of all consultations [7].

Explanations for the lower replay rate found in the present study are numerous. First of all, participants were not encouraged to replay the consultation, contrasting previous studies [3–5, 14, 15, 26]. Second, participants were not a designated group, consultations varied greatly in length and substance, and many were follow-up consultations, as opposed to the previous research that mainly focused on initial, complex or bad news consultations [1, 3–5, 10–13, 15]. Consequently, our results provide an estimate of the need and usefulness of routine recordings over all types of consultations.

Earlier studies using audio tapes often provided a designated timeframe for replay therefore presenting no information on the replay timing. Remarkably, we found that almost half of all replays occurred within 24 h following the consultation, and nearly three-quarters of all replays occurred within 2 weeks. This finding may indicate an immediate need for patients to recapitulate the consultation and an unmet information need among relatives. However, recordings might be relevant in other settings. A recent study by Newnham et al. [27] found recordings to be valuable for both patients and relatives when discharging inpatients from the hospital.

Unexpectedly, only one in every six pediatric consultations was replayed, with ‘no need for replay’ as the most common reason among parents for not replaying. The only published study from a similar setting was an uncontrolled survey by Rylance [20] from 1992, reporting replay by nearly all parents. Although this result could be influenced by replay incitement, it is remarkable that our findings are so low. Possible reasons could be that the majority of children had previously attended the outpatient clinic, the paediatric consultations were by far the longest with more than half of the consultations exceeding 20 min and all health professionals had attended a communication skills training course [28]. The written comments support these findings, with parents reporting no need for replay,
because they had attended the clinic for several years and felt very well-informed. Several parents would have liked a recording of previous consultations and found audio recording of future consultations to be desirable if changes in for instance treatment of their child should occur. These requests are in line with findings in a study by Liddell [17] of routine appointments in general practice. This study also found a somewhat lower replay rate than in most cancer studies, although still higher than the findings in our study.

As found in previous studies, patient evaluation of technical feasibility, audio quality and future provision were mainly positive. Nevertheless, complaints about the audio quality of the children’s and adult patients’ voices must be taken seriously before further implementation. The process with implementation of DARs might benefit from experiences described in a recent Australian study [29] successfully using a collaborative methodology when implementing an electronic health record. Likewise, implementation barriers and facilitators described by Ijkema et al. [30] could prove relevant.

Strengths and limitations of the research
A main strength of the study was the use of consultation recordings in routine practice in outpatient clinics, including a wide range of consultations across different clinical specialties and the participation of several health professionals. Furthermore, the results are based on a large patient group with a relatively high response rate compared with other surveys at Danish outpatient clinics [31]. In addition, the use of a digital recording platform made it possible to add valuable information to existing knowledge about patients’ use of the recordings. Finally, to the best of our knowledge, no previous studies have investigated this existing knowledge about patients

Outpatients’ use of digital audio recording • Health Information Technology 471

Acknowledgements
We thank all patients for their participation, and the participating outpatient clinics and health professionals for audio recording their consultations. Thank you also to Mette Axboe for crucial assistance in the inclusion period.

Funding
This work was supported by the Region of Southern Denmark; Lillebaelt Hospital; the University of Southern Denmark; TrygFonden (110631); the Novo Nordisk Foundation (1035037); and the Lundbeck Foundation (65/2011). None of these funding sources had any involvement in the research.

References