Does the use of a visualised decision board by undergraduate students during shared decision-making enhance patients’ knowledge and satisfaction? – A randomised controlled trial

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Abstract

Objectives: Aim of this RCT was to evaluate whether the added use of a decision board (DB) during shared decision-making improves patients’ knowledge as for different treatment options and overall satisfaction with the consultation.

Methods: Forty-nine undergraduate students were trained in shared decision-making (SDM) and evaluated by an Objective Structured Clinical Examination (OSCE). According to their test results, all participants were randomly allocated to either the test- (DB) or the control-group (Non-DB). Both groups performed SDM with patients showing a defect in a posterior tooth (Class-II defect). Prior to the interview, patients of the DB group were given the decision aid for review. In the Non-DB group, patients were consulted without additional aids. After treatment decision, a questionnaire was completed by all patients to measure knowledge (costs, survival rate, characteristics and treatment time) and overall satisfaction with the consultation. Fifty DB patients and 31 Non-DB patients completed the questionnaire.

Results: DB patients \( (n = 50) \) demonstrated a statistically significant increase in knowledge compared to the Non-DB group \( (n = 31) \) (Mann–Whitney U-test; DB group = 10.04; Non-DB group = 4.16; \( P = 0.004 \)). There was no significant difference between groups regarding satisfaction with the consultation \( (t\text{-test}; P > 0.05) \).

Conclusions: During the shared decision-making process, the use of a decision board yielding information about Class-II treatment options leads to a significantly higher patient knowledge compared to knowledge gained through consultation alone. It is therefore desirable to provide DBs for dental diagnoses with several treatment options to increase transparency for the patient.

Introduction

The patient’s right of self-determination especially in decision-making processes is an international standard in medicine (1). Decision aids are used during medical decision-making by introducing the characteristics of different therapeutic options to patients in cases where patients should be involved in the decision-making process. Therefore, guidelines to ensure the quality of patient-oriented decision aids were stipulated in 2006 by the International Patient Decision Aid Standard (IPDAS) Collaboration (2).

In Germany (3) and other European countries, patients show an increasing interest in participating in the medical decision-making. While at the time the majority of the patients preferred a passive role during medical treatment (4), nowadays 51% of the surveyed people from 8 European countries prefer to decide about further treatment together with their doctor. Only 26% want their doctors to take the decision for them and...
23% tend towards making their own choice regarding medical attendance (5). Every dentist has a legal and also an ethical obligation to obtain informed consent from the patient before treatment can commence (6). To reach informed consent, the physician discloses and the patient understands the diagnosis, the relevant options for treatment (including no treatment) and any respective risks and benefits (7).

SDM is increasingly accepted as an ideal model of treatment decision-making in the medical encounter (8). This communicative approach aims to involve doctors as well as patients in the medical decision-making process. Thus, it is important that patients acquire sufficient knowledge about the available therapeutic options. Owing to the fact that this knowledge is mostly subject specific, the need for comprehensible decision boards that inform about different therapeutic options increases (9, 10). Decision aids improve the decision quality, the subject feeling of being informed and the clarity of the corresponding values. However, these effects vary across studies (11).

A routine decision-making in dentistry concerns the options for invasive treatment of primary or secondary carious lesions in pre-molars and molars. Especially for Class-II restorations, miscellaneous restorative materials with different advantages and disadvantages exist (12). Varying costs, treatment time, survival rate and material properties increase the abundance of information to be discussed. To date, only limited data are available about decision boards concerning this problem. Johnson described the use of a DB for clarifying treatment alternatives when root canal therapy or extraction and possible tooth-replacement were indicated (13). Yet patients tend to misinterpret written facts, especially relative risks (14).

The aim of the present clinical study was to determine the benefits of using a visualised DB in the process of making shared decisions in the treatment of Class-II defects. The hypothesis of the present study was that DB patients have more knowledge and feel better informed about the therapeutic options of their chosen therapy than Non-DB patients. The total knowledge score regarding the chosen treatment option calculated from a patient questionnaire served as primary endpoint. Secondly, it was to be investigated whether DB patients consider themselves better informed than Non-DB patients.

Materials and methods

Selection of students and patient allocation
The total process of students random allocation as well as the patient allocation is described in the Consort flow diagram (Fig. 1). This clinical study was conducted during the undergraduate treatment courses of the second and fourth clinical semesters of the Department of Operative Dentistry and Periodontology, University of Cologne with the approval of the local ethic committee (Dossier No. 11–268). Dental students of these clinical courses were included and educated on SDM on two half days as part of the routine curriculum. These 49 students were classified according to their communication skills in an objective structured clinical examination (OSCE) that was conducted by two examiners and two actors playing patients. Together with this patient, the student had to decide on a further treatment of Class-II defects within a maximum of 8 min. This examination was evaluated according to the common standards of state examinations. Owing to their results, the students were divided into two groups of overall equal quality by means of a rank transformation. Then, the two groups were randomly (dice) assigned to the DB group (n = 24) and the Non-DB group (n = 25). A mere randomisation of students might have led to groups with different overall levels of communication skills. To minimise this possible bias, the rank transformation was effected before randomisation. Both groups were advised of the study procedure and received a hand-out including the criteria of the therapeutic options (as described on the DB). Only the DB group was additionally familiarised with the DB.

In total, all patients who met the inclusion criteria (Class-II defect, willing to be theraped by undergraduate students) and who during the period from May to August 2011, that is the time span of 1 semester, were treated by students of the practical clinical courses in the Department of Operative Dentistry and Periodontology were included in the survey (n = 81). The patients were assigned to the students according to common standards of the University Hospital of Cologne, independently and without knowing which group the students belonged to. Patients of both groups are described in Table 1.

Decision board
The DB was developed and optimised in the clinical routine as for comprehensibility of information. The therapeutic options presented on the DB are no therapy, gold cast, amalgam, ceramic, simplified composite (bulk-filled QuiXfil; Dentsply, Konstanz, Germany) in combination with a self-adhesive bonding (XenoV; Dentsply) and composite restoration with incremental filling technique (CeramX mono; Dentsply) in combination with an etch-and-rinse adhesive (Optibond Fl; Kerr).

The factors shown on the DB are ‘survival rate’, ‘treatment time’, ‘costs’/’self-payment’ and ‘characteristics’. The described criteria, except for time and cost, were based on reviews about survival rates (12, 15) and comparison of material properties (16). The ‘characteristics’ are substance loss, side effects and abrasion/mastication comfort.

The criterion ‘survival rate’ was presented in natural frequencies with positive and negative notation. According to the literature, this form of presentation is the most non-judgemental and comprehensible one from the patients’ point of view (17). The treatment costs were calculated according to the national guidelines for medical fees for the statutory system and private health insurance funds (BEMA and GOZ). The treatment times were defined according to the measurements in private practices (18) using a linear correction factor, because of the limited treatment routine of the students and the additional time for assessment of the students’ work by supervisors. Prior to implementation in the clinical routine, the DB was optimised as follows: to ensure the comprehensibility of the summary and the simplified presentation of the information on the DB, the described facts were further visualised (19, 20). Subsequently 30 patients used the DB to eliminate potential shortcomings of the presentation of the information and the content of the DB in a pre-study. These patients were excluded from the participation in the following clinical trial.
The final version of the DB used for the study includes a description of the different therapeutic options for Class-II defects for the purpose of the best available evidence (Fig. 2).

Clinical procedure

After a Class-II defect was diagnosed, the supervising dentist handed out the DB to a student who in turn left it with the patient for at least 5 min. After that, the patient and the student made a conjoint decision on the further treatment. In the Non-DB group, the treatment options were discussed without employing the DB.

Patient questionnaire

The completion of both the informed consent and the patient questionnaire took place in a separate room in the absence of the student upon finalisation of the treatment session. The
TABLE 1. Characterization of patients: No differences between DB- and Non-DB patients could be detected according to their age, gender and caries experience (characterized by DMFT)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>DB group</th>
<th>Non-DB group</th>
<th>t-tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>40.27</td>
<td>40.88</td>
<td>P = n.s.</td>
</tr>
<tr>
<td>DMFT</td>
<td>14.47</td>
<td>13.27</td>
<td>P = n.s.</td>
</tr>
<tr>
<td>Gender</td>
<td>M = 44%</td>
<td>M = 45%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F = 56%</td>
<td>F = 55%</td>
<td></td>
</tr>
</tbody>
</table>

The patient questionnaire contained 4 questions on the patients’ knowledge concerning the criteria conveyed by the DB, two questions concerning the patients’ satisfaction with the consultation and one question regarding the importance of the different criteria. The questions about ‘survival rate’, ‘treatment time’, ‘costs’ and ‘self-payment’ were open questions, whereas the question about ‘characteristics’ contained three single-choice questions. The satisfaction with the consultation during the shared decision-making process was measured with a VAS-scale (100-mm line, very unsatisfied – very satisfied).

Data processing and analysis

Missing answers were treated as incorrect answers, while illegible answers were treated as missing values. A Mann–Whitney U-test (SPSS version 17.0, IBM, Ehningen, Germany) was conducted regarding the difference of the total knowledge score between the DB and the Non-DB group. The significance level was set at $P < 0.05$. A posteriori Mann–Whitney U-tests and a subsequent Bonferroni adjustment ($P < 0.01$) were conducted to compare knowledge scores between the groups regarding the single questions. A t-test was used to determine differences in the patients’ satisfaction ratings between the two groups. Finally, it was analysed by means of a Wilcoxon test, whether patients were able to memorise the total costs and the share of self-payment, irrespective of which group they belonged to.

Results

117 patients with posterior defects were enrolled during the 3-month period of the study. 24 patients had to be excluded from the study; 22 patients did not fulfil the inclusion criteria (Class-II defect), and two patients did not want to participate in the study for personal reasons. 57 of the remaining patients were enrolled in the DB group, and 36 patients in the Non-DB group. 7 DB patients and 5 Non-DB patients did not fill in the questionnaire. Finally, the following data refer to 50 questionnaires of DB patients and 31 questionnaires of Non-DB patients. The characterisation of patients is shown in Table 1.

Significant differences in the total knowledge score were found between the groups (Table 2). In total, DB patients achieved 60% correct answers, whereas Non-DB patients gained 27%. Significant differences for all single items between DB and Non-DB group could be detected with the exception of the item ‘characteristics’ (Table 3). Irrespective of the group, all patients showed significantly less knowledge about ‘total costs’ than about ‘self-payment’.

Regarding patients’ satisfaction with the consultation, no differences could be found (Table 4). The analysis of the VAS-scale showed an overall mean value of 89. The mean value of DB patients was 91, for Non-DB patients 86 (with a range from 0 = very unsatisfied - to – 100 = very satisfied). Seventy-seven of 81 patients (95%) confirmed to have received sufficient information, and three did not confirm and one patient did not answer at all.

Discussion

The results of the present study showed that the additional use of a DB during SDM significantly increases the patients’ knowledge about their choice of therapeutic option. While the DB increased patients’ knowledge, it has to be stated that in the present RCT, we were able to confirm Johnson’s results (13) and even with the aid of the visualised and thus optimised DB, a higher satisfaction in patients was not achieved. The decision about preserving or losing a tooth is comparatively far-reaching and might affect patients more than the choice of a restorative material. In particular, the choice of a restorative material might be of lesser emotional relevance to patients than the preservation or loss of a tooth would be.

In our study, the patients’ satisfaction concerning the medical consultation was rather high. As all consultations were based on the model of SDM, it can be assumed that this type of communication for a decision-making process is generally approved by patients, irrespective of whether a DB was used or not. Yet this dialogue-technique requires a lot of practice to have an economy and time benefit; hence, it is desirable that students receive an extensive training already during their study (21). In addition, forensic advantages for the dentists could be identified as a result of the communicative process of SDM having been documented. However, in medical treatment and especially in life-threatening situations, patients’ satisfaction is often improved by the use of a DB (8).

In comparison with studies in the field of general medicine, describing only 2–3 treatment options on a DB (8, 22), the amount of information contained in this study’s DB is significantly larger. There are at least 6 treatment options, with 4 criteria each, resulting in a total of 24 information fields. It is noteworthy that the total knowledge score in the DB group is still very high in the present study. It can be assumed that the use of a decision aid, especially in domains with a variety of treatment options, is advantageous for both patients and doctors. The successful consultation with a decision aid might be explained with the optimisation of the DB used. The double effort of offering facts in written text as well as per visualisation proved to be more readily accessible to human understanding (14, 17).

Another approach concerns the presentation of probabilities, because different publications show that the depiction of statistic data carries the risk of biased, albeit unintentional, assessment of such data (23, 24). Rather than presenting information in conditional probabilities, solely natural frequencies in positive and negative notation were used. Presenting information in natural frequencies is a simple and effective mind tool to reduce the confusion resulting from conditional probabilities (25).
Your dentist has advised you that you have a defect restoration or decay in a posterior tooth, which in case of therapy may lead to a multi-surface restoration.

### Type of care

<table>
<thead>
<tr>
<th>Type of care</th>
<th>Treatment time</th>
<th>Costs / self-payment €</th>
<th>Characteristics</th>
<th>Survival rate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No therapy</strong></td>
<td>None, except consulting</td>
<td></td>
<td>Uncontrolled loss of healthy tooth substance</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>High probability of progression of caries and pain</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Impaired mastication</td>
<td></td>
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<tr>
<td><strong>Amalgam</strong></td>
<td>1 session à 1 h 20 min and 1 session of 20 min</td>
<td>Costs: ca. 60 € Self-payment: 0 €</td>
<td>Excessive loss of healthy tooth substance</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Well-tolerated and moderate occurrences of side effects</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Low abrasion</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>After 10 years, 80 of 100 intact restorations, 20 defective</td>
<td></td>
</tr>
<tr>
<td><strong>Gold cast</strong></td>
<td>2 sessions à 3 h</td>
<td>Costs: ca. 460 € Self-payment: ca. 330 €</td>
<td>High loss of healthy tooth substance</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Well-tolerated and very rare occurrences of side effects</td>
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<td></td>
<td>Low abrasion</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>After 10 years, 91 of 100 intact restorations, 8 defective</td>
<td></td>
</tr>
<tr>
<td><strong>Composite (simple)</strong></td>
<td>1 session à 1 h 30 min</td>
<td>Costs: ca. 60 € Self-payment: 10 €</td>
<td>Minimal loss of healthy tooth substance</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Well-tolerated and very rare occurrences of side effects</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Moderate abrasion</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>After 10 years, 73 of 100 intact restorations, 27 defective</td>
<td></td>
</tr>
<tr>
<td><strong>Composite (multilayer technology)</strong></td>
<td>1 session à 2 h</td>
<td>Costs: ca. 130 € Self-payment: 70 €</td>
<td>Minimal loss of healthy tooth substance</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Well-tolerated and very rare occurrences of side effects</td>
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<td></td>
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<td></td>
<td>Moderate abrasion</td>
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<td></td>
<td></td>
<td></td>
<td>After 10 years, 83 of 100 intact restorations, 17 defective</td>
<td></td>
</tr>
<tr>
<td><strong>Ceramic</strong></td>
<td>2 sessions à 3 h</td>
<td>Costs: ca. 350 € Self-payment: 220 €</td>
<td>High loss of healthy tooth substance</td>
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<td>Well-tolerated and very rare occurrences of side effects</td>
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<td>Low abrasion</td>
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<td></td>
<td></td>
<td></td>
<td>After 10 years, 87 of 100 intact restorations, 13 defective</td>
<td></td>
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</tbody>
</table>

![Fig. 2. Decision Board used in the clinical trial. Smilies, used to visualize the information of the ‘success-rate’, had already been implemented in patient communication and the bullet points used to visualize the information of the ‘characteristics of the therapeutic options’ were designed according to a traffic light. With regard to quality assurance, the DB was developed according to a list of criteria which had been established as guidelines for the development of novel decision aids (2). To ensure the understandability of the summary and the simplified presentation of the information on the DB, the facts as described above were additionally visualised. The DB fulfils the key requirements expressed as a checklist of the (IPDAS). *Treatment times are calculated as worst case scenarios.](image)
During the development of the DB, the relevant scientific facts were expressed in non-judgemental phrases, because verbal descriptions often already contain judgement. For an example, the description ‘aesthetically high quality’ for a restorative material is already judgemental; for instance, golden restorations are highly appreciated and connotated in some cultures, whereas in others they are regarded as unaesthetic.

Several studies in the field of human medicine indicated that decision aids as well as evidence-based medicine are not value-free. The mere selection and presentation of scientific information already have an impact on patients’ autonomy and SDM (21). Therefore, the present study’s DB was from the very start designed in accordance with the guidelines of the IPDAS Collaboration. In general, patient decision aids have the ability to increase people’s involvement and are more likely to lead to informed value-based decisions (9). However, these effects can only be expected, if relevant quality criteria are fulfilled (2).

Even though DB patients showed an overall better performance, there was no difference between the test group and the control group concerning the single-choice questions on the ‘characteristics of the therapeutic option’. A variety of factors such as the low visualisation of this single item, the perceived unimportance of the described facts or the complexity of the given information could be responsible for these results.

The fact that patients perceive their self-payment more explicitly than the total costs for the healthcare system is crucial for the statutory system. As consultation and payment for it do not happen simultaneously, most patients are possibly not aware of the fact that their health care is not for free, but is rather paid for by their monthly contributions to the health insurance fund.

For the generalisation of the study results, it can be critically discussed whether the communication skills of dental students are as distinct as those of more experienced dentists. At the University of Cologne, however, students receive an extensive training in social and communicative competences during the longitudinal curriculum from their first to their last semester. It was shown that solely interacting with patients during a clinical treatment course does not per se improve professional communication skills. In contrast, implementation of a communication skills course enhanced the practical competence in dentist–patient interaction (26). Guiles and Tatum showed in a retrospective study that generic communication skills acquired during the time of undergraduate studies are applied in everyday praxis (27). Our results are therefore only conferrable for those dentists who have been professionally educated in communication.

Conclusion

The use of a visualised DB significantly improves the knowledge of the patients about their chosen treatment option in comparison with that of patients making shared decisions without any written aid. However, this gain in knowledge does not improve the patient’s satisfaction with the communication process in comparison with SDM-procedure without DB.

As a consequence of the educational observations, we can recommend the integration of a visualised DB as an obligatory component into the clinical practice of communication skills
and applied evidence-based dentistry. The general high satisfaction with the counselling is an affirmative answer for the education of students in SDM, so SDM will continue as an inherent part in clinical education.

For practical dentistry, there is a need for further decision aids in comparable clinical scenarios, thus enabling dentists to better communicate the different therapy options.

Acknowledgements

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References