



Construct validation of educational technology for patients through the application of the Delphi technique*

Validação de constructo de tecnologia educativa para pacientes mediante aplicação da técnica Delphi

Validación de un constructo de tecnología educativa para pacientes mediante la aplicación de la técnica Delphi

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ABSTRACT

Objective: To describe the process of validation of an educational technology for patients undergoing orthognathic Surgery with Delphi technique. **Method:** Four maxillofacial surgeons, two nurses, two nutritionists and two speech therapists. These indicate issues to be addressed in the material in the first round of Delphi technique. After construction of the researcher, based on the literature, the ambulatory and Internet patient's needed and results of the first phase, started the second and third phase of the validation technique and the relevance of information designed this educational technology. **Results:** In the second round achieved at least 90,0% agreement for all categories. In the third round a 12% increase for item content, language, an improvement of 6,7%, 12,5% in illustrations, layout 3,3%, 10% culture and motivation remained constant. **Conclusion:** The Delphi technique may be an important tool in the construction and validation of educational technology.

Keywords: Health education; Delphi technique; Patient education handout; Validation studies

RESUMO

Objetivo: Descrever o processo de validação de uma tecnologia educativa para pacientes submetidos à cirurgia ortognática, mediante a aplicação da técnica Delphi. **Métodos:** Participaram do estudo, dez juízes (quatro cirurgiões bucomaxilofaciais, duas enfermeiras, duas nutricionistas e duas fonoaudiólogas) que indicaram os assuntos a serem abordados no material destinado à primeira fase da técnica Delphi. Após a construção do material e a obtenção dos resultados da primeira fase, iniciou-se as segunda e terceira fases dessa técnica com validação da pertinência das informações contidas nessa tecnologia educativa. **Resultados:** Na segunda rodada, obteve-se, pelo menos, 90,0% de concordância em todas as categorias. Na terceira, houve um aumento de 12% para o item conteúdo, melhora de 6,7% em linguagem, de 12,5% em ilustrações, de 3,3% no leiaute, de 10% em cultura, mantendo-se constante o item motivação. **Conclusão:** A técnica Delphi, pode ser uma importante ferramenta na construção e validação de tecnologias educativas.

Descritores: Educação em saúde; Técnica Delfos; Prospecto para educação de pacientes; Estudos de validação

RESUMEN

Objetivo: Describir el proceso de validación de una tecnología educativa para pacientes sometidos a cirugía ortognática, mediante la aplicación de la técnica Delphi. **Métodos:** Participaron en el estudio, diez jueces (cuatro cirujanos bucomaxilofaciales, dos enfermeras, dos nutricionistas y dos fonoaudiólogas) que indicaron los asuntos a ser abordados en el material destinado a la primera fase de la técnica Delphi. Después de la construcción del material y la obtención de los resultados de la primera fase, se inició la segunda y tercera fases de esa técnica con validación de la pertinencia de las informaciones contenidas en esa tecnología educativa. **Resultados:** En la segunda vuelta, se obtuvo, por lo menos, el 90,0% de concordancia en todas las categorías. En la tercera, hubo un aumento del 12% para el ítem contenido, mejora del 6,7% en lenguaje, del 12,5% en ilustraciones, del 3,3% en el esbozo, del 10% en cultura, manteniéndose constante el ítem motivación. **Conclusión:** La técnica Delphi, puede ser una herramienta importante en la construcción y validación de tecnologías educativas.

Descriptores: Educación en salud; Técnica Delfos; Folleto informativo para pacientes; Estudios de validación

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INTRODUCTION

Printed educational materials contribute favorably in the communication process, besides increase adherence to the treatment and decision-making power, as they provide consistent information, enable portability, flexibility, patient feedback and reinforce the instruction verbalized⁽¹⁾. In literature, there is a consensus on the verbal guidance with writing as more effective, which increases patient understanding and promotes better recovery⁽²⁾.

Normally, the creation of an educational material requires two types of research: one, thematic kind and other of diagnosis, in which you need to read what authors say on the subject, know the opinion of experts, or incorporate some of these experts in the production team. After that, you must choose the central ideas that will be addressed by the material, as well as the theme through which to seek to generate a learning experience. However, the opinion of experts or reading texts will not be sufficient, because it is also necessary to know the pedagogical contexts and especially the persons to whom the material is intended⁽³⁾.

A methodology that uses the Delphi technique may be useful in the development of educational materials with the participation of experts.

A technique called "Delphi" allows to consult a group of judges regarding future events, through a questionnaire, which is continuous times passed on until a convergence of responses is obtained, a consensus, which is the consolidation of intuitive judgment group⁽⁴⁾.

Based on opinions, points of agreement and disagreement among the experts, it is intended to reach some consensus elements. Unlike other research strategies, their goal is not to derive a simple answer or only reach a consensus, but getting answers and opinions of quality for a given question presented to the expert panel⁽⁵⁾.

It begun in the 50s, by researchers at the Rand Corporation, these scholars sought a method of predicting the future; when they found a method of feedback, they called as Delphi. It was based on the assumption that "two heads are better than one"; and was understood to have more opinions about a subject better guided decision-making⁽⁶⁾.

The technique remained forgotten for years, but it was retaken in new areas such as administration, social planning, research and education. In the 1990s, some work in nursing applied this technique⁽⁷⁾; the technique has essential characteristics that make it useful: anonymity (judges are not exposed and so feel free to provide feedback), feedback (responses

and opinions of judges, guiding the researcher) and flexibility (freedom of schedules, time and place to judges respond to the questionnaire)^(6,8). In practice, this controlled feedback consists in referring to all participants in successive rounds, the information generated at each step⁽⁹⁾.

The Delphi process technique begins with the formulation of the problem and the choice of judges, followed by an initial questionnaire which acts as a strategy to generate ideas to find out what it says about the subject of the study (brainstorming). The feedback of the answers is offered in a second round and a new questionnaire is designed to gather opinions on what was raised. An analysis of the responses of judges and other rounds with the answers of these are performed in order to make them reflect and opine until the acceptable consensus on the given topic^(6,8,10).

The disadvantage is that multiple rounds can take months to complete, and requires engagement of the professionals involved in the response for not giving up among cycles of rounds.

For this work, the application of the Delphi technique aimed helping the construction of an educational material for patients undergoing orthognathic surgery and evaluate with the multidisciplinary team the relevance of information contained in this technology.

METHODS

In this article, the data presented are part of a thematic project that aimed to develop an educational technology for patients undergoing orthognathic surgery, approved by the Ethics Committee of the University of São Paulo Nursing School (Process #972/2010). For the participants who consented with the research a Statement of Informed Consent were obtained in two copies.

The methodological approach followed two steps: building an educational material for patients undergoing orthognathic surgery and validation of information contained with the help of judges.

For the Delphi technique were proposed three rounds of evaluation: the first consists of an open question for brainstorming, "what is important for the guidance of patient undergoing orthognathic surgery?"; the second, evaluation of educational materials built as to the coherence/pertinence and Illustration of the information; the third, final evaluation of the material after corrections performed based on the suggestions of the second round. The rounds of the Delphi technique used can be viewed in figure 1.

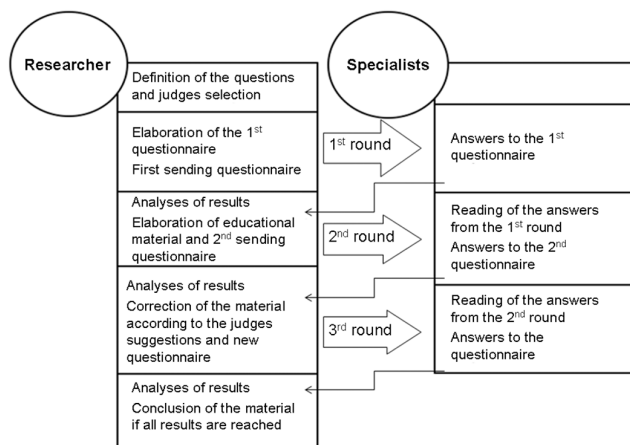


Figure 1. Strategy of Delphi technique proposed for this work.

For each judge was mailed a tool for characterization of the group with the first issue of the Delphi technique and a letter of introduction of the educational material.

After the first round of the Delphi Technique, the educational material called “Orthognathic Surgery for Patients” was constructed from data obtained in relevant subprojects from the thematic project: literature review⁽¹¹⁾, the results obtained from the focus group, searches in blogs and from the first round of the Delphi technique jointly to the judges. The program Microsoft Publisher® was used for building material, written with plain language directed to the lay public (patients), following the recommendations for making educational material cited in the literature^(12–14). The illustrations were done by a cartoonist for better understanding and adherence to reading.

The instrument developed for evaluations of the judges after the first round consisted of 22 evaluation items divided into six categories (content, language, illustration, layout, motivation and culture) with Likert-type responses, with five levels (strongly disagree, disagree, neither agree nor disagree, agree, strongly agree) and three essay questions that refer to errors or ideas harmful, lack of some information and comments.

The Likert scale items were assessed by proportions. The internal consistency evaluation of the instrument was made by Cronbach’s alpha and agreement among the judges by intraclass correlation coefficient with a significance level of 5%, using the software Statistical Package for Social Science.

RESULTS

The results for validation of the content of the educational material will be presented following the phases of development of the Delphi technique.

Characterization of the judges: The panel of judges was composed of ten healthcare professionals

who treat patients undergoing orthognathic surgery (four maxillofacial surgeons, two nurses, two nutritionists and two speech-language pathologist). The age of the professionals ranged from 23 to 45 years; three professionals had 0-5 years of graduation, three of them ranged from 6 to 10 years, three from 11 to 15 years and only one above 20 years of graduation.

First round: This round was intended to know what the judges deemed important to inform the patient during procedures pertaining to the orthognathic surgery. The information provided related to guidelines in the pre-operative, intraoperative and postoperative, as listed below: documentation and surgical guide; risks inherent in the procedure; surgical time expected; need for additional procedures; absolute fasting; description of the type of anesthesia (general); anesthetic recovery; bleedings; paresthesia; facial edema; bed head raised to reduce edema and temporary hearing change; use of ice compresses; chewing and breathing difficulties; voice and postoperative muscle movements alterations; liquid diet; eating light meals for two months (without solid foods); standard chewing and swallowing; oral hygiene; use of elastic inter-occlusion; hematoma; pain; use of lip lubricant; use of nasal decongestants; risk of infection; outpatient follow-up of 30 days; break of expectation about aesthetics; head, body, lips and tongue posture; loss weight; nausea/vomiting/constipation; sun exposure after four months; continuity in the use of braces; not blowing the nose; communication strategies and speech enhancement; difficulty in acceptance from the family members; suture dehiscence; absence from work for a specified time.

Second round: The second round of the Delphi technique consisted of sending educational material built for judges to validate the material though of Likert-type instrument (results in Chart 1), and three open questions.

The analysis of open responses contributed to changes in the text. The datas of Chart 1 shows the result of the question about writing mistakes and changes.

The second question, concerning the lack of any information, brought up items related to drugs, multidisciplinary team and some suggestions for adding information or content review. The third question was about the reviews, leaving the judge free to contribute their experience.

The changes that were considered relevant by the researcher were made and a new educational material was printed, sent back to the judges, along with the assessment tool, giving rise to the third round of the Delphi technique.

Third round: The results obtained with the instrument were analyzed quantitatively.

Chart 1 – Changes in educational material made after evaluation of the judges in the second round of the Delphi technique

Original sentence	Suggestion of the judge	Change performed
It depends on the surgery, the technique applied.	The anchorages may be different.	The anchorages may be different and depend on the surgery.
Fasting (including water)	Fasting 8h.	Fasting 8h (including water).
The cuts are inside your mouth, so no scars.	Sometimes there may be scars.	The cuts ... and in this case there will be no scarring. If you need some external cut, there may be scars.
You will be able to talk and eat.	Gives an idea that would be any food.	You will be able to talk and ingest liquids.
Normally, it will not be like that... It will be only for a period.	Replace by “as you won’t...” or “it will be only for a period.”	However, it will be only for a period.
...tingling in the region of the mandible, nose, lip and chin ...	Sensitivity changes on the palate	... tingling in the area of the mandible, palate, nose, lip and chin...
Infection is rare in this surgery	Surgical wound located in the contaminated cavity	It is rare in this surgery but might occur when the cavity (mouth) is contaminated
dental braces... for a little longer (about 8 months to 1 year)	time of orthodontics, the surgeon cannot know it exactly	dental braces for a little longer according to the orthodontist (about 8 months to 1 year)
Return after surgery	Returning after surgery means returning to the odontologist?	Returning to the clinic after surgery

Table 1 – Frequency distribution of scores obtained in the evaluation of judges, according to the instrument items. São Paulo. 2011

Items	Scores*					
	SD	D	NAD	A	SA	S
Content						
1.1 The content is appropriate for the target audience	-	-	-	4	6	10
1.2 The division of the headings and subheadings of the material is relevant	-	-	-	3	7	10
1.3 The key passages (passages highlighted) are important and noteworthy	-	-	-	2	8	10
1.4 The content is sufficient to meet the needs of the target audience	-	-	1	4	5	10
1.5 The sequence of the text is logic	-	-	-	4	6	10
Subtotal (%)	-	-	2	34	64	100
Language						
2.1 The writing style is compatible with the target audience	-	-	-	5	5	10
2.2 The writing used is attractive	-	-	-	6	4	10
2.3 The language is clear and objective	-	-	-	4	6	10
Subtotal (%)	-	-	-	50	50	100
Illustrations						
3.1 The illustrations are relevant to the content of the material and clarify the content	-	-	-	3	7	10
3.2 The illustrations are clear and transmit ease of understanding	-	-	-	3	7	10
3.3 The subtitles applied are appropriate and help the reader to understand the picture	-	-	-	3	7	10
3.4 The amount of illustrations is suitable for the educational material content	-	-	-	6	4	10
Subtotal (%)	-	-	-	37,5	62,5	100
Layout						
4.1 The typeface used facilitates reading	-	-	-	2	8	10
4.2 The colors applied to the text are relevant and makes the reading easy	-	-	-	3	7	10
4.3 The visual composition is attractive and well organized	-	-	-	4	6	10
4.4 The format (size) of the educational material and the number of pages is appropriate	-	-	-	5	5	10
4.5 The text layout is adequate	-	-	-	5	5	10
4.6 The font size of the titles, subtitles and text is appropriate	-	-	-	4	6	10
Subtotal (%)	-	-	-	38,3	61,7	100
Motivation						
5.1 The content is motivating and encourages continuing reading	-	-	-	3	7	10
5.2 The contents aroused interest to the reader	-	-	-	3	7	10
5.3 The content addresses the questions, clarifies and educates the patient during the postoperative	-	-	-	3	7	10
Subtotal (%)	-	-	-	30	70	100
Culture						
6.1 The text is compatible with the target audience, taking into account various profiles of patients	-	-	-	5	5	10
Subtotal (%)	-	-	-	50	50	100
Total (22 items)	-	-	1	84	135	
Total (%)	0	0	0,5	38,2	61,3	

*SD – Strongly Disagree; D – Disagree; NAD – Neither agree nor disagree; A – Agree; SA – Strongly agree; S – Sample

Table 2 – Frequency distribution of absolute scores by judges according to instrument items in the third round of the Delphi technique. São Paulo. 2011

Items	Scores*					
	SD	D	NAD	A	SA	S
Content						
1.1 The content is appropriate for the target audience	-	-	-	3	7	10
1.2 The division of the headings and subheadings of the material are pertinent	-	-	-	2	8	10
1.3 Os trechos chave (trechos em destaque) são importantes e merecem destaque	-	-	-	1	9	10
1.4 The content is enough to meet the needs of the target audience	-	-	-	3	7	10
1.5 The sequence of the text is logic	-	-	-	3	7	10
Subtotal (%)	-	-	-	24	76	100
Language						
2.1 The writing style is compatible with the target audience	-	-	-	5	5	10
2.2 The writing used is attractive	-	-	1	4	5	10
2.3 The language is clear and objective	-	-	-	3	7	10
Subtotal (%)	-	-	3,3	40	56,6	100
Illustration						
3.1 The illustrations are relevant to the content of the material and clarify the content	-	-	-	2	8	10
3.2 The illustrations are clear and transmit ease of understanding	-	-	-	2	8	10
3.3 The subtitles applied are appropriate and help the reader to understand the picture	-	-	-	3	7	10
3.4 The amount of illustrations is appropriate for the content of the educational material	-	-	-	3	7	10
Subtotal (%)	-	-	-	25	75	100
Layout						
4.1 The typeface used facilitates reading	-	-	-	2	8	10
4.2 The colors applied to the text are relevant and makes the reading easy	-	-	-	3	7	10
4.3 The visual composition is attractive and well organized	-	-	-	3	7	10
4.4 The format (size) of the educational material and the number of pages is appropriate	-	-	-	4	6	10
4.5 The text layout is adequate	-	-	-	5	5	10
4.6 The font size of the titles, subtitles and text are appropriate	-	-	-	4	6	10
Subtotal (%)	-	-	-	35	65	100
Motivation						
5.1 The content is motivating and encourages continuing reading	-	-	-	3	7	10
5.2 The contents aroused interest to the reader	-	-	-	3	7	10
5.3 The content addresses the questions, clarifies and educates the patient during the postoperative	-	-	-	3	7	10
Subtotal (%)	-	-	-	30	70	100
Culture						
6.1 The text is compatible with the target audience, taking into account various profiles of patients	-	-	-	4	6	10
Subtotal (%)	-	-	-	40	60	100
Total (22 items)	-	-	1	68	151	
Total (%)	0	0	0,5	30,9	68,6	

*SD – Strongly Disagree; D – Disagree; NAD – Neither agree nor disagree; A – Agree; SA – Strongly agree; S – Sample

In this round, the essay questions regarding the missing ideas or unclear were presented by only two judges and covered aspects related to provision of subtitles, excerpt key, grammar tenses and spelling (Chat 2).

Chart 2 – Changes in educational material made after evaluation of the judges in the third round of the Delphi technique

Original sentence	Suggestion judge	Change performed
The big day has come	The surgery day has come	The surgery day has come
You get the headboard....	You will get the headboard....	You will get the headboard....
Surgery and the sensitivity in the region	Surgery and the mobility and sensitivity in the region	Surgery and the mobility and sensitivity in the region
Oral cavity (mouth) has been contaminated	Oral cavity (mouth) is contaminated	Oral cavity (mouth) is contaminated

The proposed amendments did not affect the content of the material and had no impact on the layout. Thus, ended the validation in the third round of the Delphi technique.

DISCUSSION

In the first round, results achieved our objective and guided the researcher to construct the first proof of educational material. Oral hygiene was most recommended by judges (70%). From 44 items listed, 56.8% were mentioned only once.

In the second round, considering the items in each assessment category it was obtained 50 responses to content, 30 to language, 40 to illustrations is, layout to 60, 30 to motivation and 10 to culture, making a total of 220 responses.

For the highest level of the Likert scale, it was obtained “strongly agree” in 32 (64%) of the category of content responses, 15 (50%) in language, 25 (62.5%) in the illustrations, 37 (61.7%) in layout, 21 (70%) to motivation and 5 (50%) to culture. By aggregating the data level “agree” responses would reach at least 90.0% for all categories.

The internal consistency of the instrument in the second round of the Delphi technique was 0.953 and the intraclass correlation coefficient was 0.476 ($p < 0.000$).

For the lowest percentage of “strongly agree” obtained in the language category, could be asked: would the judges think that the patient does not understand the writing? or do the judges have little knowledge about writing methods? With this, this item would be reassessed in the third round of the Delphi technique or later in the evaluation with the patient, along with the culture category for its relationship with language.

When evaluating Chart 2, it was perceived that the suggested changes resulted details that improve patient understanding and were accepted as being relevant to the content and bring greater clarity to the item.

In the second qualitative question, regarding the lack of information shall mean that the use of continuous medication must be reported to the professional during the preoperative period. Therefore, the observation made by the judge was inserted in excerpt “Preparation for surgery” as a warning to the patient as follows: “remember to tell the surgeon the medicines you are taking and illness you have.”

The quotation of the multidisciplinary team was held at the beginning of the educational material through the phrase “post-operative, the professionals, nurse, nutritionists, speech-language pathologist may be present.” The description of the surgical language has been improved, but technical terms are difficult to change to a lay language. It was decided to wait for the evaluation of the patient.

The third question about the comments, most of them showed satisfaction with the material presented.

However, three comments presented critiques to the educational material, description related to diet, esthetic and text format.

The proposed diet is a generalized protocol, but some patients may not be able to perform it, and they followed their own planning to return to the normal diet. In case the patient presents an eating disorder or if their weight loss is significant, an appointment with a nutritionist is recommended.

The esthetic was related to the illustrations for not having the same style among the images. For the judge, the images should have the same colors and design features, which for the researcher is not interesting because it would leave the work monotonous and would not arouse the interest of the patient.

Another professional judged the material to be lengthy, but a large quantity of information is sometimes necessary, and line spacing facilitates reading material. Due to the reduced size of the paper and images need, the material would remain with 24 pages.

In the third round, an analysis by category shows that with regard to the content 38 (76%) “strongly agreed”, an increase of 12% when compared to the second round of the Delphi technique. In language also improved by 6.7%, 12.5% in illustrations, 3.3% in layout, 10% of culture and motivation remained constant.

Internal consistency in the third round Delphi was 0.972 and the intraclass correlation coefficient was 0.601 ($p < 0.000$). Despite maintaining the significance, it was observed in this round an improvement in the intra coefficient value.

This analysis by category showed that changes made to the first draft of the material provided significant changes to improve the material, according to the perspective of judges and the researcher.

Some suggestions were proposed by the judges, such as: placing text together to illustrations, highlight the search for a speech-language pathologist. These were seen as improvements and heeded by the researcher. The comments presented by the five judges were acknowledgments and congratulations for the work.

In this research, professional agreement with the educational material presented results growing between the second and third phase of the Delphi technique. The levels of the Likert scale, “agree” and “strongly agree” were respectively 30.9% and 68.6% in the third round, which together would represent 99.5% concordance with the built educational materials.

A study about construction of educational materials for women with mastectomies⁽¹⁵⁾ also considered the levels “agree” and “strongly agree” as similar, which results can be combined. Other evaluation studies of educational materials⁽¹⁶⁻¹⁸⁾ used different instruments, precluding its use for discussion of the present results.

Even without standardization of instruments for assessment of the educational materials and validation method, the construction of educational materials geared to the target audience, with the participation of experts, may raise acceptance and patient compliance in using this method for health education.

CONCLUSIONS

We noted that there is not a standardized instrument for assessing educational materials. Some studies apply

qualitative evaluation, others quantitative, but without a standardized model. The values obtained in this research were greater than 70% of agreement among the judges, and thus, considered satisfactory for educational material finalization and study continuation for a second stage of evaluation with patients undergoing orthognathic surgery, subject to future research.

It is concluded that the Delphi technique can be an important tool in the construction and content validation of an educational technology for the education of perioperative patients.

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