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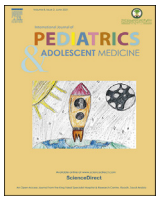

Effect of lumbar puncture educational video on parental knowledge and self-reported intended practice

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ABSTRACT

Background: Lumbar puncture (LP) remains an essential diagnostic procedure for neurological and infectious diseases. However, it remains a source of anxiety to patients and families. This research aimed to assess the impact of a newly developed educational simplified video about LP, in the parents' native language, that is tailored to their social background and beliefs and to assess whether it can facilitate their consent for the procedure.
Methods: This prospective, interventional study was conducted at the outpatient pediatric clinics at a teaching hospital. The conventional arm used verbal explanation about LP. The second method utilized a standardized video, having the same information as the conventional arm, with streaming of graphic depictions. Parents' knowledge and perceived LP risks were measured before and after the intervention.
Results: Two hundred and one parents were enrolled, with no significant differences in the socio-demographic and baseline characteristics. Both verbal and video-based counseling were found to provide a statistically significant increase in knowledge scores, and a Wilcoxon signed-rank test showed that knowledge gains for both groups were statistically significant (Verbal Explanation: W = 2693, n = 83, $P < .001$ and Video: W = 5538, n = 117, $P < .001$). However, the conventional verbal counseling resulted in more consistent gain of knowledge (SD = 14.5) as compared to the video group (SD = 18.94). The video group reported higher perceived risk (Mean 8.2, SD 3.59) than the verbal explanation group (Mean 7.12, SD 2.51). The less educated parents perceived LP procedure to be of significantly higher risk after watching the video ($P < .001$). It was found that 73.6% of persons with perceived intention to refuse LP changed their opinion after either of the counseling interventions, with significant opinion difference pre- and post-counseling intervention (P value .002).
Conclusions: Video education in parents' native language about LP is as effective as conventional verbal education for informed consent, with the additional advantage of reproducibility and more illustrations

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to give parents better insight. However, this video should be followed by direct interaction with parents to ensure their full understanding and address any further concerns.

1. Background

Despite the progress in the diagnostic modalities, lumbar puncture (LP) remains a cornerstone diagnostic, therapeutic, and anesthetic procedure. When suspecting Central Nervous System (CNS) diseases such as infections, LP is usually the method of choice to confirm or rule out the suspicion.

However, the procedure for LP presents a source of anxiety and fear to patients and their families, leading to refusal of the procedure on many occasions, which may compromise or delay the patients' accurate management [1–3]. Moreover, the lack of a Cerebrospinal Fluid (CSF) sample for analysis and cultures in CNS infections, for example, may lead to unnecessary use of multiple broad-spectrum antibiotics and other antimicrobials as empirical therapy, which might be associated with side effects, increased cost, and development of antimicrobial resistance.

Obtaining informed consent to perform LP could be considered more challenging than other common invasive medical procedures. Some studies reported LP refusal [2,3] as well as requiring more time and effort to get consent than other riskier and more painful procedures in the emergency department [4]. This could be related to people's misconceptions about LP and inadequate communication tools and skills when consent is sought. Previously, specific criteria were suggested for appropriate informed consent for LP, including risks and benefits, alternatives to the procedure, explanation of the procedure, and a signature of a witness [5].

The use of videos to present information seeking consent is not a new approach, having begun in the 1970s [6], and has been used to get consent for diagnostic procedures [7–10]. Nowadays, this tool may have much broader applications in the current era of modern online video streaming and advanced technology tools.

In the present study, we aimed to assess a newly developed educational tool that could facilitate LP consenting with the use of an instructional video with simple terminology in the parents' native language and tailored to their social background and beliefs.

2. Method

2.1. Study design and population

This was a prospective interventional study that was conducted at the outpatient pediatric clinics of a university teaching hospital in Saudi Arabia. The study included only parents, aged 20 years or older, and fluent Arabic (mother tongue) as the primary language of the studied educational tools. Participants were selected by convenience sampling while visiting the pediatric clinics, and each subject was randomly assigned to either a conventional arm group or video-guided group. Subjects were approached in weeks 1, 2, 7, and 8 of the study and were allocated to the conventional arm, while the subjects involved in the second video-based arm were approached in the other period (weeks 3–6). Of note, none of them were scheduled to have LP performed on them or their siblings.

The conventional arm was the verbal explanation (Appendix I) given on a routine basis to parents of children undergoing LP in the pediatric emergency department. In contrast, in the video-based arm, we utilized a standardized video on this group that contains the same information as the conventional arm, but with graphic depictions (https://www.youtube.com/watch?v=Q2gm_iL5ZQE&t=95s or the shortcut: https://bit.ly/2mG12q0). After either explanation tool, the parents were given the opportunity to ask questions regarding any aspect of the LP procedure.

The verbal and videotape information were standardized according to the multi-professional discussions between the pediatric intensive care (PICU), the pediatric infectious disease (PID), the pediatric neurology, and the pediatric emergency department (ED) teams within our institution.

2.2. Assessment measures

Subjects were asked to respond on a questionnaire to explore their baseline knowledge on LP as a diagnostic procedure. The questionnaire was generated after careful review of the literature and after a panel of experts from relevant specialties, namely the PICU, ED, pediatric neurology, and PID team members, reviewed the quality and content of each tool being used. The final version of the tool was tested to ensure clearance and appropriateness for the target population in this study.

The respondents were asked to answer a knowledge test with true, false, or do not know on six questions prior to and after exposure to each educational method (Appendix II). The questions were as follows: LP is used to diagnose meningitis, blood tests are good alternatives to LP for diagnosing meningitis, brain computerized tomography (CT) scan can be an alternative to LP for the diagnosis, a physician can diagnose meningitis without the aid of LP, LP poses more risk to patients than the disease itself, and neonates can undergo LP if they needed one. The correct answers were assigned 10 points each, and incorrect answers were assigned zero, and so the maximum possible score was 60. The knowledge score best correct answers were based on experts' careful evidence review of the epidemiological consequences of LP in both adults and children [11,12].

Additionally, the respondents were asked to answer seven questions that assessed Perceived Risk of LP complications pre- and post-education on a 0–4 Likert-like scale (coded as zero uncertain, 1 Never, 2 sometimes, 3 often, and 4 very often). This questionnaire included the following statements: LP can have very severe side effects, LP can lead to Paralysis, LP can lead to enuresis, LP can lead to sterility, LP can lead to scoliosis, LP can lead to meningitis, general anesthesia is needed to obtain LP in children, and lastly, LP can lead to chronic back pains. The maximum possible score is equal to 7 items x 4 = 28, and the uncertainty was coded with zero. The summative analysis was utilized to compute a total knowledge score (out of 60 possible correct answers) and total perceived risk (also out of 28 points).

3. Results

The study included 201 subjects: 118 (58.7%) males and 83 (41.3%) females. All of them completed the pre-intervention and post-intervention questionnaire (Appendix II). A comparison of their socio-demographic characteristics is shown in Table 1. We found no significant differences between the two groups regarding

gender, age groups, nationality, and educational level.

Table 2 shows the differences in lumbar puncture knowledge and risk perceptions pre- and post-education. Within the verbal explanation counseling group, the mean for the self-reported knowledge for LP showed significantly higher post-education scores compared to the pre-education scores (45.78 [14.58] versus 20.72 [18.1] with $P < .001$). Similarly, within the video-guided counseling group, there were significantly higher post-education mean scores for the self-reported knowledge of LP (42.46 [18.94] versus 19.32 [18.3] with $P < .001$). Conversely, the mean score for LP-risk perception showed significantly higher pre-education mean scores (6.5 [4.51] versus 8.2 [3.59] with $P < .001$).

Table 3 shows a comparison of pre-and post-education mean scores of LP consenting and perceived risks in both groups. Responses of both groups regarding the question related to their previous consent for LP for themselves or their siblings did not show any significant differences. However, answers to the question of whether LP can have serious side effects showed significantly more answers for strongly agree and agree in the post-education video-guided counseling group compared to the verbal counseling group [9 (7.6%) versus 2 (2.4%) and 34 (28.8%) versus 10 (12%), respectively, with P value .016 for both]. On the other hand, the answers with disagreement showed significantly more answers in the pre-education group [41 (49.4%) versus 41 (34.7%) with P-value .016].

4. Discussion

Obtaining informed consent to perform LP could be considered more challenging than other common procedures, and the procedure has been reported to be refused by many patients [2,3]. With retrospective charts review, it was found that many important points were not adequately documented in the consent forms [5]. This may imply that parents were not making real, informed decisions. They have also recommended using alternative methods, like video, when informing parents about procedures. Moreover, LP consent was also reported to require more time than other more risky and painful procedures in the emergency departments [13].

Refusal of LP has been reported in some studies, and the refusal rate ranged from 24 to 44% [2,3]. The main reasons for refusal were fear of paralysis, painful nature of the procedure, and fear of death [2]. Other possible reasons that were less common causes for refusal included scoliosis, developmental delay, and epilepsy. Moreover, it was reported in a study that 21% of parents who refused LP felt that the procedure was unnecessary, and two families in the same study doubted the motives behind the request for consent [3]. Patients or their families' misconceptions about the procedure and inadequate communication tools and skills utilized when the consent is sought might have impacted their reluctance to consent for LP. Informed consent about any medical procedure implies proper communication in the same person's terminology and language so that the participant is well aware of the procedure's risks and benefits.

In the current study, we reported a significant increase in the number of parents who agree to consent after both types of interventions (verbal explanation and video-guided counseling) in the parents' native language. Similar to our findings, videos have been reported to be useful for education in various medical disciplines [7,14,15]. A prospective randomized study on the use of videos for preoperative education of patients undergoing regional anesthesia found that those who watched a video before the procedure had much less anxiety than those who only received verbal education [7]. Patients with closed ankle fracture viewing videotaped information before giving consent for ankle fracture surgery demonstrated an overall increased understanding of the risks, benefits, alternatives, and postoperative treatment compared to patients who received information verbally [16]. Videotape education has been used to educate women prior to sterilization surgery and has shown significantly higher knowledge scores compared with women only receiving the conventional consultation [17]. However, some reported that using video-guided counseling lead to more comprehension and understanding of the procedure, while others reported no significant differences compared to conventional counseling methods [7–10]. This variation in results could be caused by differences in the quality and content of videos in relation to the target procedure, the counselors' communication skills, and the cultural and socio-demographic characteristics of the target population.

Notably, although Arabic is the native language in Saudi Arabia, the health care system uses English as the official communication among healthcare providers and in the medical health records. Therefore, providing such educational videos in Arabic, with English subtitles, can empower communication between parents and healthcare workers. Moreover, video consent has the potential to minimize the time required for prolonged counseling by physicians, especially in busy services like the emergency department. Instead, brief counseling after the videos may be sufficient, without sacrificing knowledge as reported [13]. Epstein et al. had also reported more changes in attitude in the video group as compared to the audio group about the cardiopulmonary resuscitation (CPR) procedure, as patients saw the aggressive nature of CPR in the video, but not in the narrative arm [18].

Table 1
Comparison of sociodemographic characteristics, knowledge of lumbar puncture, and perceived risks among the studied groups (Total number = 201).

Variables	Verbal explanation counseling N = 83	Video-guided counseling N = 118	*P* value
Gender: (number and %)			
Male	49 (59.1%)	69 (58.47%)	.527
Female	34 (40.9%)	49 (41.53%)	
Age groups (years): (number and %)			
20–30 years	31 (37.35%)	39 (33.05%)	.597
31–40 years	38 (45.78%)	51 (43.22%)	
41–50 years	9 (10.84%)	21 (17.79%)	
>50 years	5 (6.03%)	7 (5.93%)	
Nationality: (number and %)			
Arab expatriates	11 (13.25%)	8 (6.78%)	.089
Saudis	72 (86.75%)	110 (93.22%)	
Education: (number and %)			
Primary and secondary	37 (44.58%)	52 (44.07%)	.528
Higher education	46 (55.42%)	66 (55.93%)	

P significant if < .05.

Table 2
Differences in lumbar puncture knowledge and risk perceptions pre- and post-education (total number = 201).

Verbal explanation counseling (number = 83)			
	Pre-education	Post-education	*P* value
Score of LP knowledge: [mean (SD)]	20.72 (18.1)	45.78 (14.58)	<.001
Score of LP risk perception: [mean (SD)]	6.81 (4.7)	7.12 (2.51)	.332
Video guided counseling (Number = 118)			
	Pre-education	**Post-education**	*P* value
Score of LP knowledge: [mean (SD)]	19.32 (18.3)	42.46 (18.94)	<.001
Score of LP risk perception: [mean (SD)]	6.5 (4.51)	8.2 (3.59)	<.001

LP: Lumbar puncture.
P significant if <.05.

Table 3
Comparison of pre-and post-education in both groups in relation to lumbar puncture consenting and perceived risks (total number = 201).

Questions	Verbal Explanation Counseling N = 83 (%)	Video Guided Counseling N = 118 (%)	*P* value
Would you consent for LP to be done to you or your sibling? (number and %)			
Undecided	4 (4.8)	7 (5.9)	.372
No, will never	0	3 (2.5)	
Yes	79 (95.2)	108 (91)	
LP can have serious side effects? (number and %)			
Strongly agree	2 (2.4)	9 (7.6)	.016
Agree	10 (12)	34 (28.8)	
Undecided	19 (22.9)	22 (18.6)	
Disagree	41 (49.4)	41 (34.7)	
Strongly disagree	11 (13.3)	12 (10.2)	

P significant if < .05.

Video education in the parents' native language was demonstrated to be an equally effective method for education regarding lumbar puncture as verbal explanation counseling. However, video-guided counseling and education have the additional advantage of reproducibility, which is training dependent and might be subjected to human errors in verbal explanation counseling. [8].

In terms of overall comprehension, the current study showed a statistically significant increase in knowledge score following the two methods (verbal and video-guided education), and both were equally effective in educating parents, regardless of their educational level. However, the observed difference in the change in knowledge scores between the two groups was not statistically significant. Dunbar et al. recently described that using the educational video about LP resulted in a significantly higher parental understanding of the procedure [19]. In our study, the equal effect on knowledge score in both arms might be attributed to having different study team operators in the verbal explanation method with different potentials, aptitudes, and vocal skills.

Our finding that people with less knowledge perceived higher risk for LP after watching the LP video-guided education could be due to the demonstrated animation of the anatomical positioning and procedure explanation with needle insertion in the back of the patients. Dunbar et al. on the other hand, demonstrated contradictory findings, with more parental comfort with the LP procedure after watching the adjunctive educational video [19]. This paradoxical negative effect could be minimized by supplementing the video with a counseling session for the parents to clarify any worrying scenes, content, and questions in the demonstration. Alternatively, providing a disclaimer at the beginning of such educational videos, which highlights the potential graphical contents of the video and emphasizes the availability of individualized counseling after the video, may be of benefit. Additionally, educational videos should be piloted among the targeted audience so that the content can be modified based on their feedback.

The combination of both video and direct verbal explanation could prove to be successful and could tailor the education to the specific needs and understandings of the parents. Future studies can use randomly generated questions on both risk and knowledge both prior and after the educational methods to effectively test actual differences in context and content.

The health care provider-patient interaction before LP is an integral part of counseling because adequate patient's informed consent necessitates the ability of the patients or their families to directly discuss their concerns regarding the indications, alternatives, and complications of any medical procedure they are to undergo. Moreover, the availability of such educational videos could help in the informed consenting process during the COVID-19 pandemic or other infectious disease outbreaks when physical distancing is encouraged.

5. Limitations

While this is the first study to explore the potential effect of educational video in the native language of participants on their knowledge and risk perception for LP, one of our limitations is that the questionnaire was given to parents who were not actually consenting for LP. Effectively, this may not be similar to the actual situation when consent for LP is needed. Hence, our findings warrant future research among actual patients' parents undergoing the LP consenting process.

6. Conclusion

Video education in parents' native language about lumbar puncture is as effective as conventional verbal education for establishing informed consent, with the additional advantage of reproducibility and clearer illustration that can give parents better insight. However, this video should be followed by direct interaction with the parents to ensure their full understanding and

address any further concerns to obtain informed consent for LP.

Credit author statement

Mohamad-Hani Temsah: Literature review, trial design and conceptualization, overlooking data collection and analysis, and manuscript drafting and finalization. **Ayman Al-Eyadhy:** method and trial design, and manuscript drafting and finalization. **Fahad Alsohime:** data analysis, manuscript drafting, revising, and finalization. **Khalid A. Alhasan:** manuscript revision and finalization. **Fahad A. Bashiri:** literature review, trial design and conceptualization from neurology team perspective, and manuscript revision. **Hashim Bin Salleeh:** educational tools scientific appraisal from emergency team perspective and video production. **Gamal M. Hasan:** literature review and manuscript revision. **Ali Alhaboob:** manuscript revision and finalization. **Narjes Al-Sabei:** manuscript revision from general pediatric perspective. **Abdullah Al-Wehaibi:** literature review, video production, and data collection. **Omar Temsah:** manuscript revision and finalization. **Ali M. Somily:** manuscript drafting and finalization with updated literature review. **Fahad Al-Zamil:** literature review, trial design and conceptualization from Infectious Diseases perspective, and manuscript drafting and finalization.

Ethical statement

Participants were informed about the research aim and their optional, voluntary participation. Institutional Review Board, College of Medicine, King Saud University, Riyadh, KSA Ref number 14/4037/IRB was obtained before the subjects' enrollment.

Ethical approval

We obtained written consent in the first page of the questionnaire, as approved by the ethics committee.

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Declaration of competing interest

None.

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Not applicable.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijpam.2020.11.003.

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