



REVISTA BRASILEIRA DE ANESTESIOLOGIA

Publicação Oficial da Sociedade Brasileira de Anestesiologia
www.sba.com.br



SCIENTIFIC ARTICLE

YouTube as a source of spinal anesthesia, epidural anesthesia and combined spinal and epidural anesthesia

Serkan Tulgar*, Onur Selvi, Talat Ercan Serifsoy, Ozgur Senturk, Zeliha Ozer

Maltepe University Faculty of Medicine, Department of Anesthesiology and Reanimation, Istanbul, Turkey

Received 4 March 2016; accepted 16 August 2016

KEYWORDS

Youtube;
Anesthesia;
Spinal;
Epidural

Abstract

Introduction: Social media as YouTube have become a part of daily life and many studies evaluated health-related YouTube videos. Our aim was to evaluate videos available on YouTube for the conformity to textbook information and their sufficiency as a source for patient information. **Material and method:** A search of the YouTube website was performed using the keywords "spinal anesthesia, epidural anesthesia, combined spinal epidural anesthesia". Firstly 180 videos were evaluated and the characteristics of the video were noted, and the features of the video too were noted if the video was regarding neuraxial anesthesia. Questionnaire evaluating the video (Q1) quality relating to neuraxial anesthesia was designed using a textbook as reference and Q2 was designed for evaluating patient information.

Results: After exclusions, 40 videos were included in the study. There was no difference in Q1 or Q2 scores when videos were grouped into 4 quarters according to their appearance order, time since upload or views to length rate ($p > 0.05$). There was no statistical difference between Q1 or Q2 scores for spinal, epidural or combined videos ($p > 0.05$). Videos prepared by a health-care institute have a higher score in both Questionnaires 1 and 2 (10.87 ± 4.28 vs. 5.84 ± 2.90 , $p = 0.044$ and 3.89 ± 5.43 vs. 1.19 ± 3.35 , $p = 0.01$ respectively).

Conclusion: Videos prepared by institutes, societies, etc. were of higher educational value, but were still very lacking. Videos should be prepared in adherence to available and up-to-date guidelines taking into consideration appropriate step by step explanation of each procedure, patient safety and frequently asked questions.

© 2016 Sociedade Brasileira de Anestesiologia. Published by Elsevier Editora Ltda. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

* Corresponding author.

E-mail: serkantulgar.md@gmail.com (S. Tulgar).

<http://dx.doi.org/10.1016/j.bjane.2016.08.005>

0104-0014/© 2016 Sociedade Brasileira de Anestesiologia. Published by Elsevier Editora Ltda. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Please cite this article in press as: Tulgar S, et al. YouTube as a source of spinal anesthesia, epidural anesthesia and combined spinal and epidural anesthesia. Rev Bras Anesthesiol. 2016. <http://dx.doi.org/10.1016/j.bjane.2016.08.005>

PALAVRAS-CHAVE

YouTube;
Anestesia;
Raquidiana;
Peridural

YouTube como fonte de raquianestesia, anestesia peridural e anestesia combinada raqui-peridural

Resumo

Introdução: As mídias sociais como o YouTube tornaram-se uma parte do cotidiano e muitos estudos avaliaram vídeos do YouTube relacionados à saúde. Nosso objetivo foi avaliar os vídeos disponíveis no YouTube para identificar a existência de conformidade com as informações em livros didáticos e sua suficiência como fonte de informação para o paciente.

Material e método: Uma pesquisa no site YouTube foi realizada usando as palavras-chave *spinal anesthesia, epidural anesthesia, combined spinal-epidural anesthesia* (raquianestesia, anestesia peridural, anestesia combinada raqui-peridural). Em primeiro lugar, avaliamos 180 vídeos e observando suas características e se eram referentes à anestesia neuraxial. O questionário de avaliação da qualidade do vídeo (Q1) relativa à anestesia neuraxial foi criado usando um livro didático como referência e o Q2 foi criado para avaliar as informações ao paciente.

Resultados: Após exclusões, 40 vídeos foram incluídos no estudo. Não houve diferença nos escores de Q1 ou Q2 quando os vídeos foram agrupados em quatro categorias de acordo com a ordem de aparecimento, tempo de upload ou taxa de tempo de visualização ($p > 0,05$). Não houve diferença estatística entre os escores de Q1 ou Q2 para os vídeos raquianestesia, peridural ou combinada ($p > 0,05$). Os vídeos preparados por um instituto de saúde obtiveram escores mais elevados em ambos Q1 e Q2 ($10,87 \pm 4,28$ vs. $5,84 \pm 2,90$, $p = 0,044$ e $3,89 \pm 5,43$ vs. $1,19 \pm 3,35$, $p = 0,01$, respectivamente).

Conclusão: Os vídeos elaborados por institutos, sociedades etc. apresentaram um valor educativo maior, mas ainda muito incompleto. Os vídeos devem ser preparados em conformidade com as diretrizes atualizadas e disponíveis, com explicações adequadas e detalhadas sobre cada procedimento, segurança do paciente e perguntas mais frequentes.

© 2016 Sociedade Brasileira de Anestesiologia. Publicado por Elsevier Editora Ltda. Este é um artigo Open Access sob a licença de CC BY-NC-ND (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

Social media and video-sharing websites such as YouTube have become a part of daily life and the number of health-related videos increases daily. YouTube is reported to be the number one source of information on health-related topics, after the patient's physician.¹⁻³ It is known that following patient-physician meetings, patients seek additional information.⁴

Social media are frequently used by healthcare professionals to follow innovation and advancement in their own field, see other practices, evaluate and send comments to video owners and interact with their peers.⁵⁻¹⁰ Medical students are also turning to social media, especially video sharing websites such as YouTube, for medical education related materials.¹¹⁻¹³

Unfortunately, many studies have demonstrated that the reliability, intelligibility and compliance to standards of many medical videos are not overseen or approved as appropriate or accurate by professionals in their field. Many studies have, therefore, investigated the reliability of internet sources health-related information¹⁴⁻¹⁹ as there is a significant risk that patients or their relatives may find missing, false or irrelevant information when they research a health-related topic online. Convincing persons exposed to this information pollution that their source is wrong information and thereafter providing accurate information is more difficult than giving information to a

person who has not been exposed to misinformation. On the other hand, small amount of inaccurate information acquired by healthcare professionals may lead to larger problems.

In patients who are due to undergo elective surgical procedures, it is very common for patients to seek information from the Internet or different sources, even after they have been given information by their surgeon and/or anesthesiologist.^{8,20} It is only natural that patients seek more and more information on a procedure they are due to undergo.

Spinal anesthesia, epidural anesthesia and combined spinal epidural anesthesia are commonly used methods for regional anesthesia. Considering the popularity of video sharing websites such as YouTube, and the view numbers of related videos, there is a high likelihood that patients would seek audiovisual information regarding these procedures too. Also, an important step of development of skills in medical students involves observation of procedures on manikins or patients, before the skill is performed and after it has been learnt from a textbook or via a professional healthcare instructor.^{21,22}

A previous study evaluated the procedural quality of 22 lumbar puncture and 16 spinal anesthesia videos posted on YouTube before March 2009.¹⁷ However, to our knowledge, there is no study including spinal anesthesia, epidural anesthesia and combined spinal epidural anesthesia. Our aim was to evaluate videos available on YouTube for the conformity

Table 1 Selection process.

Search keyword	Accepted	Rejected
Spinal anesthesia (60)	Spinal (23) Epidural (1) Combined (2)	Did not meet inclusion criteria (12) Not spinal but related anesthesia (6) Not related anesthesia (6) Duplication (10)
Epidural anesthesia (60)	Epidural (9) Combined (2)	Did not meet inclusion criteria (19) Duplication (16) Not epidural but related anesthesia (2) Not related anesthesia (12)
Combined (60)	Combined (3)	Did not meet inclusion criteria (9) Duplication (34) Not neuraxial but related anesthesia (3) Not related anesthesia (11)

to textbook information and their sufficiency as a source for patient information.

Material and method

A search of the YouTube (<http://www.youtube.com>) website was performed on 15.12.2015 using the keywords "spinal anesthesia, epidural anesthesia, combined spinal epidural anesthesia". All times, all countries and English language was chosen as the YouTube filter with results to appear from most relevant to least relevant. The first 60 results for each search result were noted.

The first evaluator evaluated 180 videos and noted the date of upload, number of views, length of video, language, relevance to search term, the characteristics of the video and if the video was regarding neuraxial anesthesia, the features of the video.

All authors reached consensus for the study design and exclusion criteria before commencement of this study. Following first evaluation, videos longer than 15 min, videos not related to neuraxial anesthesia, videos not in the English language and repeat videos were excluded from the study.

After initial evaluation and exclusions were performed, five reviewers evaluated the video quality and adequacy as an information source for patients. This evaluation was performed using two questionnaires designed by authors. Reviewers were also asked to classify each video as being either; for medical education, for healthcare professionals, for patient information, product advertisement, institute promotion, confusing, other. The aim of the video was determined as the option at least three reviewers chose. If a classification was not chosen by at least three of the reviewers, then re-classification was performed until at least three reviewers agreed on the classification. Questionnaire evaluating the video (Q1) quality relating to neuraxial anesthesia was designed using a textbook as reference.²³⁻²⁵ A focus group meeting was performed where all authors reached consensus on the questions for Q1. The second questionnaire (Q2) was designed, using the same method, based on a question and answer page on the American Society of Regional Anesthesia's website, available at: <https://www.asra.com/page/41/regional-anesthesia-for-surgery>. The

questionnaires contained 10 and 5 questions each, respectively. Every evaluation criterion was scored as none, average and good on the basis of certain aspects. A rubric was available for all raters. For Q1 none, average and good received 0, 1 or 2 points and for Q2 they received 0, 2 or 4 points, respectively. Some items contained two questions. In this case, the raters were instructed to choose none: if both questions were not answered, average: if one was fully and two were partially/inadequately answered, good: if both questions were adequately answered. Therefore, each video received a score ranging from 0–20 points. Scoring was performed using a rubric that each reviewer had access to and was designed by one of the authors. Videos were accepted as being very bad (0–4 points), bad-average (5–8 points), average (9–12 points), good (13–16 points) or very good (17–20 points).

Statistical analysis

Inter Rater Reliability (IRR) was calculated for each video using Fleiss' Kappa for rating score calculator available at <https://www.statstodo.com/CohenKappa.Pgm.php>. Descriptive evaluation was performed for each video. Kappa < 0 – no agreement, 0.0–0.20 – insignificant agreement, 0.21–0.40 – moderate agreement, 0.41–0.60 – most part agreement, 0.61–0.80 – significantly agreement, 0.81–1.00 – excellent agreement.

All other statistical evaluation was performed using SPSS 16.0 (SPSS, Chicago, IL, USA). *U* test was used for comparison of medians between two groups. More than one group was compared using ANOVA. Normal distribution was evaluated with Shapiro–Wilk test. The post-hoc-Tukey test was used for comparison of groups with normal distribution and Tamhane test was used for comparison of groups that were not distributed normally.

Results

After exclusions, 40 videos were included in the study. Of these, 23 were related to spinal anesthesia, 10 epidural anesthesia and 7 combined spinal epidural anesthesia. The video evaluation process and videos by exclusion criteria are

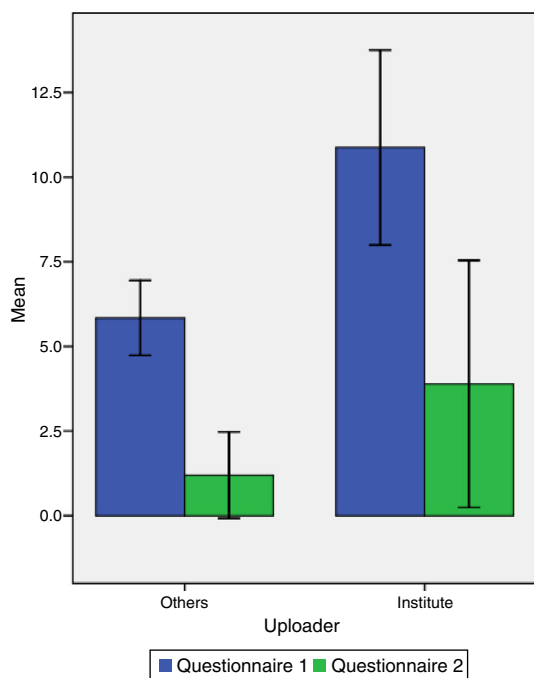


Figure 1 Distribution of questionnaire results according to video uploader.

shown in Table 1. Time since video upload ranged from 0–98 months with an average of 39.6 ± 23.2 m. Average video length was 280 ± 180 s (90–900 s).

Videos were classified as aimed at medical education or health professionals in 24, aimed for patient information in 5, web site promotion in 2, institute promotion in 1 and confusing in 5 videos.

Average score of videos from Questionnaire 1 which measured procedural quality was 7.14 ± 3.88 (0.6–15.4). Eight videos were classified according to Questionnaire 1 scores as being very bad, 19 videos as bad-average, six videos as average and 7 videos were classified as average-good. No video was classified as being very good. Only 2 of 13 videos classified as average or average-good were uploaded by an official organization, such as hospital, institute or society.

When videos were evaluated according to patient information with Questionnaire 2, average score was found to be 1.93 ± 4.13 (0–15.9). One video was classified as being very bad, 3 videos as average and 2 videos as average-good. Seventeen videos received no points from any reviewers. All videos classified as being average or average-good were reported as being patient information videos by the reviewers and all had been prepared by an academic institute or hospital. Videos were grouped as being uploaded by a healthcare institute or not and Questionnaire 1 and Questionnaire 2 results were compared. Videos prepared by a healthcare institute have a higher score in both Questionnaire 1 and 2 (10.87 ± 4.28 vs. 5.84 ± 2.90 , $p=0.044$ and 3.89 ± 5.43 vs. 1.19 ± 3.35 , $p=0.01$ respectively). Fig. 1 shows the questionnaire results according to uploading source.

There was no difference in Q1 or Q2 scores when videos were grouped into 4 quarters according to their appearance order, time since upload or views to length rate ($p > 0.05$).

There was no statistical difference between Q1 or Q2 scores for spinal, epidural or combined videos ($p > 0.05$) (Fig. 2).

Results of evaluation of Q1 and Q2 are given in Figs. 3 and 4. When Q1 was evaluated, 80% of videos did not include step-by-step instructions, 50% did not introduce materials (needle, catheter etc.) to be used, 70% did not include patient monitorization, 50% did not give information on the drugs used or describe the administration of infiltrative anesthesia, over 90% did not mention contraindications and 80% did not mention complications. All videos generally included the video’s aim and video content and title were in concordance. 60% of videos partially or fully described the appropriate anatomical structures and close to 80% stressed the importance of sterilization.

When Q2 was analyzed, over 80% of videos did not answer any of the questions. Only around 5% of videos could be classified as being good according to Q2.

When videos were evaluated according to sterilization techniques, 13 used betadine, 1 used betadine and isopropyl alcohol, 1 used betadine and spirit, 6 used isopropyl alcohol, and 2 used chlorhexidine for procedure area sterilization. Seven-teen videos did not mention the agent used. Sterile drape was used in 3 of isopropyl alcohol, 1 of betadine and 1 or chlorhexidine videos. Videos using chlorhexidine were dated from 2014–2015, videos using isopropyl alcohol from after 2012 and all videos using a sterile drape were from after 2012. Videos using betadine were observed to be newly uploaded videos. Neuraxial anesthesia was performed in the sitting position in 26, side position in 10 and was not mentioned in 4 videos.

When IRR was evaluated, kappa score was between 0.61–0.80 in 7 videos (significant agreement), 0.41–0.60 in 31 videos (most part agreement) and 0.21–0.40 in 2 (moderate agreement) videos. The highest and lowest Kappa score was 0.69 ± 0.07 and 0.37 ± 0.09 respectively. IRR was generally high for all videos.

Discussion

The results of our study have shown that while there is numerous videos on spinal, epidural and combines anesthesia on video sharing website YouTube, more than half of these videos are low quality with relation to procedure technique, and nearly completely inadequate for patient information purposes.

Social media has gained popularity in all aspects of life as well as medicine. There are many studies that have evaluated YouTube videos for their quality for being used to give patient information and for improving skill in medical education.^{1–3,8,11} With regard to anesthesia, we are aware of only one study by Rössler et al.¹⁷ that evaluated videos uploaded before and including 2009. In this study, 16 spinal anesthesia and 22 lumbar puncture videos were evaluated and the videos’ quality was found to be low and the authors reported that and some aseptic techniques that could be considered dangerous were used. We also found that video quality was generally poor in our study. Appropriate sterilization techniques were only defined or demonstrated in around 45% of videos. 20% of videos were classified as being extremely poor quality. On the other hand, more recently

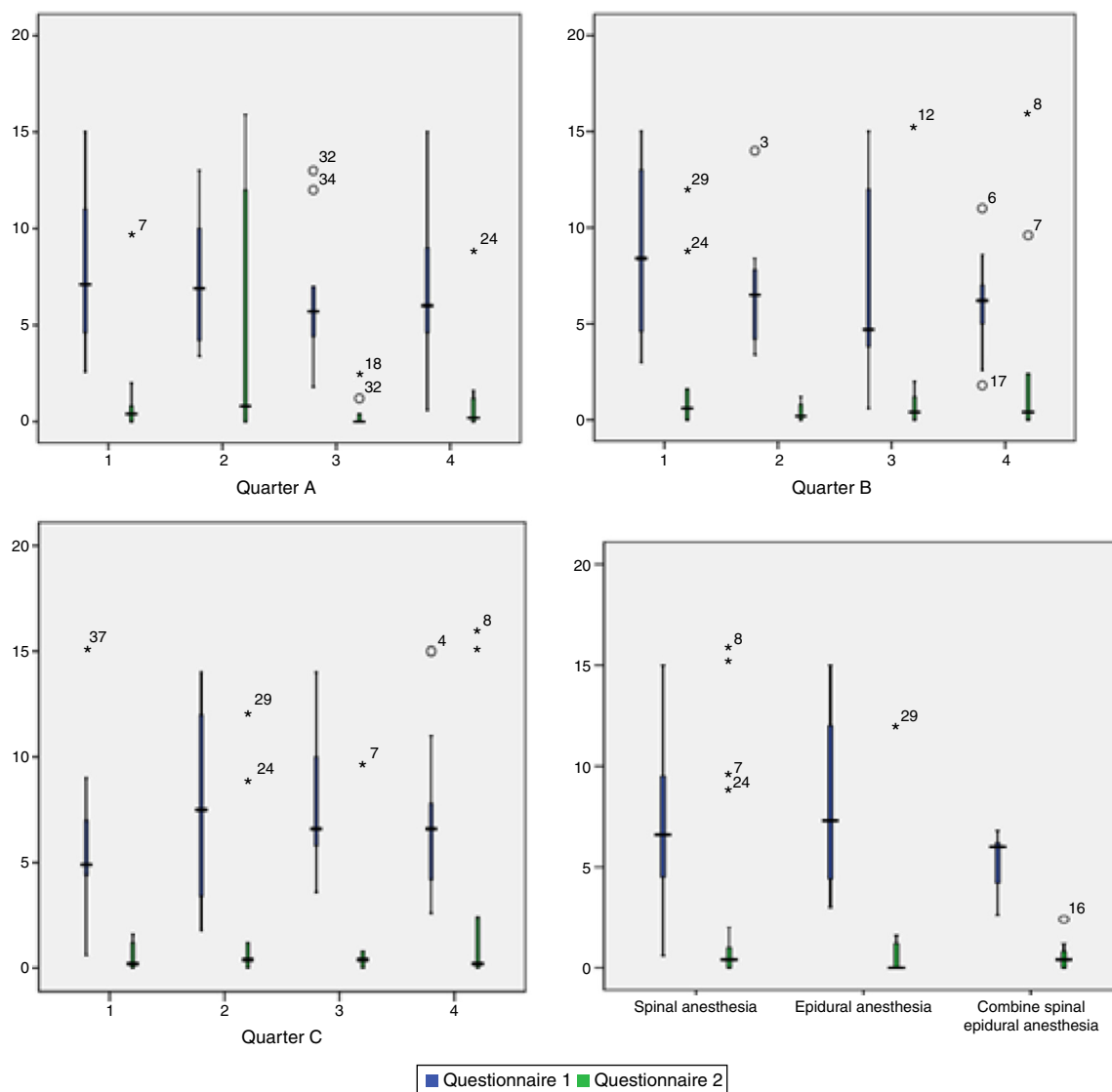


Figure 2 Distribution of search result sequence (Quarter A), loading time (Quarter B) and views/video length (Quarter C) according to neuraxial anesthesia type.

uploaded videos were found to better adhere to asepsis techniques.

There are many recently published studies comparing the use isopropyl alcohol and/or chlorhexidine vs. betadine for skin preparation.²⁶⁻²⁹ These studies have also reported an increase in the use of isopropyl alcohol and/or chlorhexidine in recent years.

Several studies have actually found that both the quality of medical procedures and their educational value are low in videos found on YouTube.^{1,3,8,30} Some studies, apart from noting the low quality of videos, have also strongly suggested that some videos contain misinformation that could lead to negative outcomes.³¹⁻³⁴ Several reports have stated that videos uploaded by health professionals or academic institutes have higher quality when compared to those uploaded by individuals, and that these videos could be beneficial for the viewing of patients.^{2,35,36} In our study we found the quality of videos generally low and their usefulness for patient information extremely insufficient. Many videos were found

to be loaded multiple times. Videos prepared by regional anesthesia societies, academic institutes or hospitals were found to have higher educational quality and better value for patient information and these videos scored higher in both questionnaires. However, we found no correlation between views/month and the quality of videos. Some studies that evaluated online videos for their value in developing medical skills also found that the quality of video correlated with the aim of the video and whether it was uploaded by an institution. Videos uploaded by professional institutions were of higher educational quality than those uploaded by individuals.^{7,18,37,38} 60% of videos included in our study were evaluated as being aimed at medical education or health-care professionals. Considering that many videos are in fact uploaded for educational purposes and not for patient information, a close adherence to appropriate guidelines will be useful for increasing the quality of these videos.

When evaluating the quality of the procedure we found that the quality of defining the aim of the video and

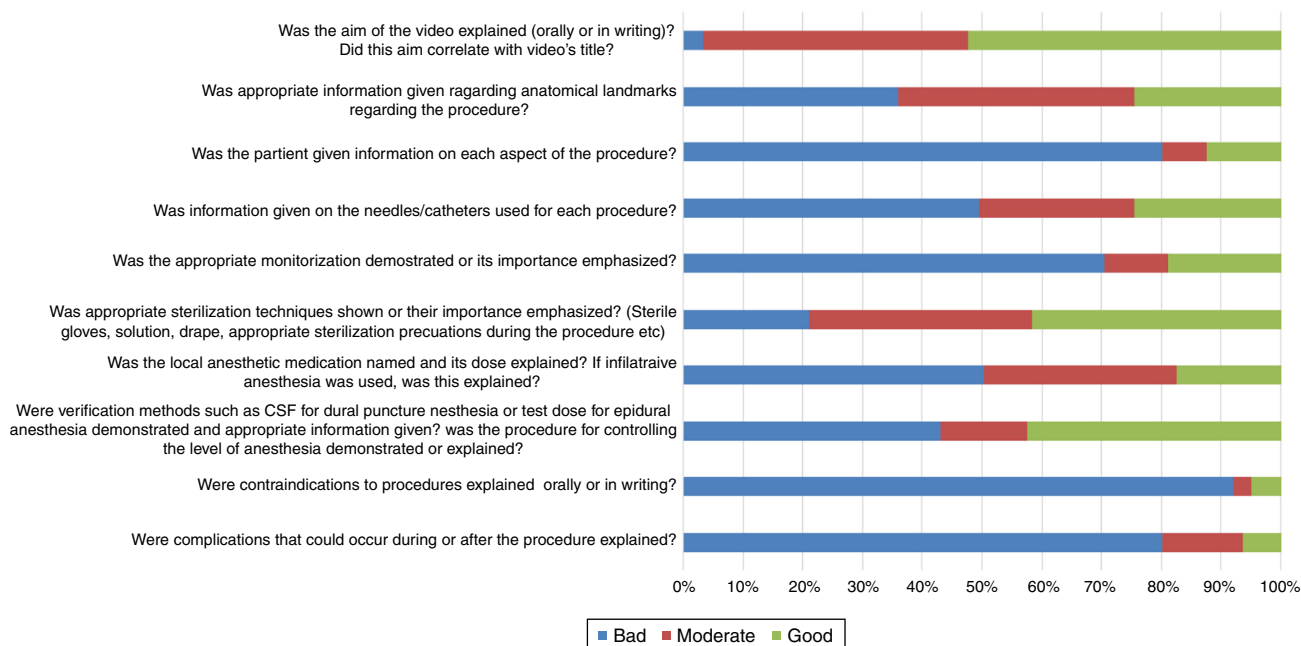


Figure 3 Questionnaire for procedural evaluating and distribution of answers.

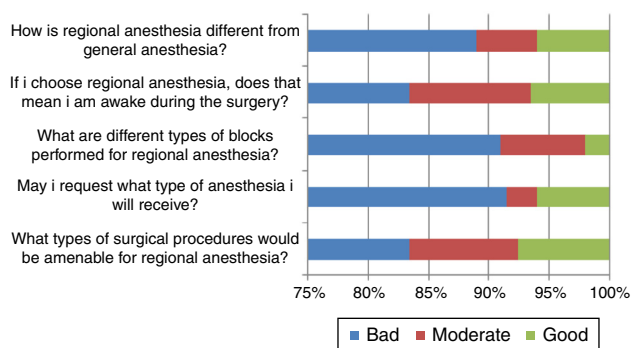


Figure 4 Questionnaire for patient information and distribution of answers.

demonstrating anatomical points was high. However, no attention was shown to complications, contraindications, the demonstration of the importance of appropriate monitorization and the provision of step-by-step information to the patient. Appropriate monitorization was demonstrated in very few number of videos. Some videos demonstrated immediate administration of medication after entrance of spinal space, before awaiting the flow of cerebrospinal fluid. In a few videos, no care was taken for appropriate sterilization procedures. We believe that such videos are harmful if they are used for educational or skill development purposes. There were very few videos classified as very high quality, further demonstrating the need for standardization and higher quality videos especially for educational purposes.

There was no correlation between the quality of video and upload time, views/video length ratio or the type of neuraxial anesthesia in the video. Previous studies have evaluated correlation between the number of views and video quality.^{2,13,17} We did not find it logical to use views as an indicator of quality, as there will be a difference in views

for older videos vs. newer ones. Instead, we preferred to use views/months since upload as an indicator. Views/months since upload did not correlate with video quality.

Our study has some limitations. We did not search for videos using keywords such as "spinal block", "neuraxial anesthesia", and "combined spinoepidural". These keywords may have revealed further videos. We only included English language videos and did not include videos in other languages. This study could have been designed so that non healthcare related individuals could evaluate each video according to its patient information quality and medical students for its educational value. All evaluators of Q1 and Q2 were healthcare professionals which may have led to a bias due to high expectations regarding video quality. Unfortunately there are no previously validated questionnaires that we could have used for this study. We, therefore, produced our own questioner, which we hope can be used in future studies. Our study evaluates the quality of previously uploaded videos. Future uploads may change our findings. Also, we chose to evaluate the first 60 videos for our search terms. This was a decision based on logical number a YouTube user would search for, not on any statistical calculation. Although this may be considered a limitation, this method has been used in similar studies previously.¹ We would like to have included video analytics such as average view duration, traffic sources and devices to our analysis. However, this information is not available via YouTube's website.

Conclusion

Although healthcare professionals and patients are turning video sharing sites such as YouTube for health-related information or education, the quality of the majority of videos regarding spinal anesthesia, epidural anesthesia or combined spinal epidural anesthesia is not suitable for these

purposes. Videos should be prepared in adherence to available and up-to-date guidelines taking into consideration appropriate step-by-step explanation of each procedure, patient safety and frequently asked questions. Although lacking in many aspects, we recommend that videos produced by institutes should be viewed for educational or informational purposes, until higher quality videos are produced.

Conflicts of interest

The authors declare no conflicts of interest.

References

1. Ho M, Stothers L, Lazare D, et al. Evaluation of educational content of YouTube videos relating to neurogenic bladder and intermittent catheterization. *Can Urol Assoc J*. 2015;9:320–54.
2. Hassona Y, Taimeh D, Marahleh A, et al. YouTube as a source of information on mouth (oral) cancer. *Oral Dis*. 2015, <http://dx.doi.org/10.1111/odi.12434>.
3. Nason K, Donnelly A, Duncan HF. YouTube as a patient-information source for root canal treatment. *Int Endod J*. 2015, <http://dx.doi.org/10.1111/iej.12575>.
4. Gupta HV, Lee RW, Raina SK, et al. Analysis of YouTube as a source of information for peripheral neuropathy. *Muscle Nerve*. 2016;53:27–31.
5. Taylor T. TF-6 the use of social media in emergency medical resident education. *Ann Emerg Med*. 2014;64:S146.
6. Arnbjörnsson E, Einar A. The use of social media in medical education: a literature review. *Creative Educ*. 2014;05:2057–61.
7. Rabee R, Najim M, Sherwani Y, et al. YouTube in medical education: a student's perspective. *Med Educ Online*. 2015;20:29507.
8. Fischer J, Geurts J, Valderrabano V, et al. Educational quality of YouTube videos on knee arthrocentesis. *J Clin Rheumatol*. 2013;19:373–6.
9. Salem J, Borgmann H, Murphy DG. Integrating social media into urologic health care: what can we learn from other disciplines? *Curr Urol Rep*. 2016;17:13.
10. Alotaibi NM, Badhiwala JH, Nassiri F, et al. The current use of social media in neurosurgery. *World Neurosurg*. 2015, <http://dx.doi.org/10.1016/j.wneu.2015.11.011>.
11. Yıldırım B, Basaran O, Alatas OD, et al. Chest tube insertion techniques on YouTube: is social media a reliable source of learning medical skills? *Am J Emerg Med*. 2015;33:1709–10.
12. Duncan I, Yarwood-Ross L, Haigh C. YouTube as a source of clinical skills education. *Nurse Educ Today*. 2013;33:1576–80.
13. Murugiah K, Vallakati A, Rajput K, et al. YouTube as a source of information on cardiopulmonary resuscitation. *Resuscitation*. 2011;82:332–4.
14. Sacchetti P, Zvara P, Plante MK. The internet and patient education—resources and their reliability: focus on a select urologic topic. *Urology*. 1999;53:1117–20.
15. Haymes AT. The quality of rhinoplasty health information on the internet. *Ann Plast Surg*. 2016;76:143–9.
16. Lee K, Hoti K, Hughes JD, et al. Consumer use of “Dr Google”: a survey on health information-seeking behaviors and navigational needs. *J Med Internet Res*. 2015;17:e288.
17. Rössler B, Lahner D, Schebesta K, et al. Medical information on the internet: quality assessment of lumbar puncture and neuroaxial block techniques on YouTube. *Clin Neurol Neurosurg*. 2012;114:655–8.
18. Camm CF, Sunderland N, Camm AJ. A quality assessment of cardiac auscultation material on YouTube. *Clin Cardiol*. 2013;36:77–81.
19. Gupta N, Sandhu G, Aggarwal A, et al. Quality assessment of YouTube videos as a source of information on Colonoscopy. *Abdomen*. 2015;2, <http://dx.doi.org/10.14800/abdomen.953>.
20. Brooks FM, Lawrence H, Jones A, et al. YouTube™ as a source of patient information for lumbar discectomy. *Ann R Coll Surg Engl*. 2014;96:144–6.
21. Vozenilek J, Huff JS, Reznik M, et al. See one, do one, teach one: advanced technology in medical education. *Acad Emerg Med*. 2004;11:1149–54.
22. Zahiri HR, Park AE, Pugh CM, et al. “See one, do one, teach one”: inadequacies of current methods to train surgeons in hernia repair. *Surg Endosc*. 2015;29:2867–72.
23. Turnbull JH, Aleshi P. Spinal and epidural anesthesia. Basic clinical anesthesia. New York: Springer; 2015. p. 211–31.
24. Brown DL. Spinal, epidural, and caudal anesthesia. *Miller's anesthesia*. Elsevier; 2010. p. 1611–38.
25. Drasner K, Larson MD. Spinal and epidural anesthesia. *Basics of anesthesia*. Elsevier; 2011. p. 252–83.
26. Campbell JP, Plaat F, Checketts MR, et al. Safety guideline: skin antisepsis for central neuraxial blockade. *Anaesthesia*. 2014;69:1279–86.
27. Checketts MR. Wash & go-but with what? Skin antiseptic solutions for central neuraxial block. *Anaesthesia*. 2012;67:819–22.
28. Darouiche RO, Wall MJ, Itani KMF, et al. Chlorhexidine–alcohol versus povidone–iodine for surgical-site antisepsis. *N Engl J Med*. 2010;362:18–26.
29. Saha S. Antiseptic solutions for central neuraxial blockade: which concentration of chlorhexidine to use? *Br J Hosp Med*. 2014;75:298.
30. Staunton PF, Baker JF, Green J, et al. Online curves: a quality analysis of scoliosis videos on YouTube. *Spine*. 2015;40:1857–61.
31. Sorensen JA, Pusz MD, Brietzke SE. YouTube as an information source for pediatric adenotonsillectomy and ear tube surgery. *Int J Pediatr Otorhinolaryngol*. 2014;78:65–70.
32. Butler DP, Perry F, Shah Z, et al. The quality of video information on burn first aid available on YouTube. *Burns*. 2013;39:856–9.
33. Stellesson M, Chaney B, Ochipa K, et al. YouTube as a source of chronic obstructive pulmonary disease patient education: a social media content analysis. *Chron Respir Dis*. 2014;11:61–71.
34. Hansen C, Interrante JD, Ailes EC, et al. Assessment of YouTube videos as a source of information on medication use in pregnancy. *Pharmacoepidemiol Drug Saf*. 2016;25:35–44.
35. Güneş T, Serinken M, Alur İ, et al. YouTube as a source of information on varicose veins. *Phlebology*. 2015, <http://dx.doi.org/10.1177/0268355515596894>.
36. Gonzalez-Estrada A, Cuervo-Pardo L, Ghosh B, et al. Popular on YouTube: a critical appraisal of the educational quality of information regarding asthma. *Allergy Asthma Proc*. 2015;36:121–6.
37. Lee JS, Seo HS, Hong TH. YouTube as a potential training method for laparoscopic cholecystectomy. *Ann Surg Treat Res*. 2015;89:92–7.
38. Topps D, Helmer J, Ellaway R. YouTube as a platform for publishing clinical skills training videos. *Acad Med*. 2013;88:192–7.