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ORIGINAL ARTICLE

Medicine Science International Medical Journal

Medicine Science 2026;15(3):1326-33

Analysis of the educational quality and reliability of Youtube videos on central venous catheter training

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Received 30 January 2026; Accepted 09 March 2026
Available online 23 August 2026 with doi: 10.5455/medscience.2026.01.031

Abstract

Central venous catheter (CVC) placement is a vital procedure in emergency medicine that requires technical expertise to reduce potentially serious complications. As YouTube has become an increasingly popular educational resource, concerns persist regarding the scientific accuracy and reliability of freely accessible procedural training videos. This study aimed to assess the educational quality and reliability of YouTube videos on central venous catheter training. A cross-sectional evaluation of YouTube videos was performed between November 22 and December 22, 2025, using the terms "subclavian," "jugular," and "femoral catheter." After screening the first 60 videos per keyword, 72 eligible videos were included. Video metrics and uploader type were recorded. Educational quality was assessed using DISCERN instrument, Journal of the American Medical Association (JAMA) benchmark criteria, Global Quality Scale (GQS), and Central Venous Catheter-Objective Structured Assessment of Technical Skills (cvcOSATS). Three experts independently scored all videos, and inter-rater reliability was evaluated with Cronbach's alpha and Intraclass Correlation Coefficient (ICC). Among the analyzed videos, 42 (58.3%) were uploaded by individuals and 30 (41.7%) by institutional sources. Median scores were GQS 3 (Interquartile Range [IQR] 3-4), JAMA 2 (IQR 2-3), DISCERN 44 (IQR 32-60), and cvcOSATS 3 (IQR 3-4), reflecting an overall moderate educational quality. Institutional videos achieved significantly higher scores across all evaluation tools ($p < 0.05$). Inter-rater agreement was good to excellent, with ICC values ranging from 0.690 to 0.939. Video duration correlated positively with quality scores, whereas popularity indicators such as views and likes did not consistently predict educational value. YouTube videos on CVC training demonstrate only moderate educational quality and should be considered supplementary resources rather than primary training tools. Institutional videos appear more reliable and comprehensive, highlighting the need for critical appraisal and guideline-based education in procedural training. Popularity indicators did not consistently predict educational value.

Keywords: Central venous catheters, social media, education, medical, benchmarking

Introduction

One of the most critical aspects of managing critically ill patients in the emergency department is the appropriate management of time. Intravenous access lines are essential for the administration of medications, fluids, and blood products. Most patients will require peripheral intravenous access during treatment. In the emergency department, placement of a central venous catheter (CVC) is often unavoidable during resuscitation, invasive hemodynamic monitoring, and procedures such as inotropic support or pacemaker insertion. When managing patients in the emergency department, it is important to select the safest route for CVC placement. The most commonly preferred sites for CVC are the internal jugular, subclavian, and femoral veins. The jugular and subclavian approaches are preferred due to their advantages in invasive hemodynamic monitoring and their lower risks of catheter-related infections and thromboembolic events. Although jugular catheterization is preferred, its complications cannot be overlooked. These complications may include carotid artery puncture, hematoma formation at the insertion site, and hemopneumothorax [1].

CITATION
Unlu A, Dolanbay T, Demir B, et al. Analysis of the educational quality and reliability of Youtube videos on central venous catheter training. Med Science. 2026;15(3):1326-33.

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DOI: 10.5455/medscience.2026.01.031

The occurrence and frequency of complications depend on the operator's skill and experience. Complication rates may also vary depending on the patient's anatomical differences, bleeding disorders, and hemodynamic instability. For all these reasons, CVC placement may be unsuccessful. Therefore, adequate training should be provided to ensure successful catheter placement by the operator [2].

With the advancement of technology, education has begun to be delivered through various modalities such as video, animation, text, and audio, and these methods are also used in healthcare education, as in many other fields. Videos are available for the purpose of care and support in patients with colostomies and for providing information and education regarding chemotherapy treatment for cancer patients [3].

The growing integration of social media into everyday life has substantially transformed educational practices. Among these platforms, YouTube has become one of the most widely utilized resources for learning purposes. Its video content is frequently accessed not only to provide information for patients but also to enhance the procedural and practical training of healthcare professionals. In recent years, an increasing number of investigations have focused on YouTube, highlighting the expanding impact of social media-based resources on medical and healthcare education. This shift was further accelerated during the COVID-19 pandemic.

Despite its widespread adoption, the use of YouTube in medical education presents notable limitations. A major concern is the lack of a formal system to verify content accuracy or ensure video reliability, which makes it challenging for viewers to critically assess the educational quality of the material [4].

Determining video quality based on a single criterion, such as view count or upload source, would not be appropriate. Healthcare professionals should be aware that the information and training provided in videos may not be reliable and may offer insufficient or inaccurate information. If a professional organization publishes an official guideline on the subject, video producers should adhere to it and include each step in their videos. The authors believe that videos should be used as supplementary tools in education rather than as primary sources.

In particular, the potential for misinformation in online videos has been frequently emphasized due to the lack of expertise among video creators and the absence of formal review processes [5].

As the use of social media platforms in medical education has increased, various methods have emerged to evaluate and improve the quality of these videos. The Journal of the American Medical Association (JAMA) benchmark criteria, the modified DISCERN score, and the Global Quality Scale (GQS) score are among the most commonly used scoring systems in this context [6].

This study investigated the reliability and educational quality of YouTube videos related to CVC placement.

Material and Methods

Video Selection and Evaluation Process

A systematic video search was performed on the YouTube platform between November 22 and December 22, 2025. Relevant content was identified by separately using the search terms "subclavian catheter," "jugular catheter," and "femoral catheter." To minimize the potential influence of prior user activity and YouTube's personalized recommendation algorithms, all searches were conducted in a browser environment with the cache and browsing history cleared.

For each keyword, the first 60 videos displayed in the search results were initially reviewed. Videos classified as YouTube Shorts, duplicate recordings, promotional or commercial materials, and content primarily intended for entertainment or music purposes were excluded.

Since the study involved only the analysis of publicly accessible online videos, no patient-related information was collected, and no invasive or interventional procedures were performed. Therefore, institutional ethics committee approval was not required.

Inclusion and Exclusion Criteria

Videos prepared for educational purposes on internal jugular, subclavian, and femoral CVC insertion were included in the study. To ensure reliable content analysis, only videos with a minimum resolution of 480p and adequate audiovisual quality were considered. In addition, to provide sufficient educational depth, only videos longer than one minute were included. Videos with English spoken narration or English subtitles were eligible for inclusion.

Videos excluded from the study consisted of YouTube Shorts, promotional or product advertisement content, entertainment- or humor-focused videos, and recordings with low audio or visual quality. This exclusion was applied to maintain scientific validity and to analyze only videos with measurable educational value.

Initially, a total of 180 CVC education videos were screened. After rigorously applying the inclusion and exclusion criteria, 108 videos were deemed unsuitable and excluded from the analysis. Consequently, 72 videos meeting the study criteria were included.

Parameters Recorded for Each Video

For each video, key data were systematically recorded, including the video link, duration (in minutes), number of subscribers, view count, and likes. Additionally, the source of the upload was identified and categorized as either institutional or individual:

Institutional uploaders: Universities, teaching hospitals, and professional medical associations.

Individual uploaders: Physicians, healthcare professionals, medical students, or general users.

DOI: 10.5455/medscience.2026.01.031

All videos were systematically reviewed by three independent experts with sufficient experience in the field. Each video was analyzed independently and scored based on pre-defined criteria for educational content, accuracy, and completeness.

To ensure inter-rater reliability, all evaluators received standardized training and participated in a pilot assessment session. For each video, the arithmetic mean of the scores assigned by the evaluators was calculated, and the resulting average was rounded to the nearest whole number to obtain the final score.

Scoring Systems for Assessing Quality and Reliability

To evaluate the educational quality and reliability of the videos, we applied well-established and validated scoring systems commonly used in the literature: DISCERN, JAMA, Central Venous Catheter-Objective Structured Assessment of Technical Skills (cvcOSATS) and GQS.

DISCERN Score:

The DISCERN score is an objective tool developed to evaluate the reliability of health education materials and the quality of information provided regarding treatment options. It consists of 16 items, each rated on a 1-5 scale (1 = very poor, 5 = very high quality). The total score reflects the overall quality of the material. The items can be grouped into three main categories:

A. Reliability

1. Clarity and comprehensibility of the presented information
2. Information based on reliable sources
3. Information presented in an unbiased (impartial) manner
4. Up-to-dateness of the information
5. Completeness of the information provided
6. Absence of biased or misleading content
7. Clear statement of the purpose of the information
8. Proper citation of sources

B. Presentation of Treatment Options

9. Explanation of different treatment options
10. Presentation of the advantages and disadvantages of each treatment option
11. Disclosure of treatment risks
12. Evaluation of the feasibility/applicability of treatment options
13. Provision of information to support patient decision-making
14. Explanation of alternative treatment options
15. Indication of the predictability of treatment outcomes

C. Overall Quality

16. Overall reliability and educational value of the material

Total Score Range and Quality Level:

16-26: Very low quality, 27-38: Low quality, 39-50: Moderate quality, 51-62: High quality, 63-80: Very high quality [7].

JAMA Scoring

The Journal of the American Medical Association (JAMA) criteria is a standardized tool used to evaluate whether online health information is ethical, transparent, and reliable.

It includes four main criteria:

- Author information
- Citation of sources
- Disclosure of conflicts of interest
- Currency of content

Each criterion is scored as "yes/no" (1 or 0 points). The total score ranges from 0 to 4; a score of 4 indicates "high reliability," while 0 indicates "non-transparent or unreliable content" [7].

Global Quality Score (GQS)

The Global Quality Scale (GQS) is a five-point Likert-type instrument that relies on the evaluator's overall impression to determine the general educational value and quality of a video. Scores range from 1 to 5, with 1 reflecting poor-quality content and 5 indicating highly comprehensive, accurate, and educationally valuable material. The GQS has been frequently applied as a standard assessment method in studies examining the reliability of YouTube videos for both patient education and clinical training purposes [8].

The videos were evaluated using a 5-item mini OSATS-based scoring system, in which each item was rated between 0 and 1 point and covered the fundamental steps of the CVC insertion procedure. This scoring system was revised for use in central venous catheter placement (cvcOSATS). The total score ranged from 0 to 5. Videos scoring between 0 and 2 points were classified as low quality, those scoring 3 points as moderate/adequate quality, and those scoring between 4 and 5 points as high quality [9].

cvcOSATS

- Was the indication and patient preparation stated? (0-1 point)
- Was the insertion site anatomy and landmark/ultrasound (US) description provided? (0-1 point)
- Were sterile technique and asepsis demonstrated? (0-1 point)
- Were the needle-guidewire-catheter steps demonstrated in the correct sequence? (0-1 point)
- Were catheter fixation and complications addressed? (0-1 point)

Statistical Analysis

All statistical evaluations were carried out with the IBM SPSS Statistics software package for Windows, version 27.0 (IBM Corp., Armonk, NY, USA). The normality of quantitative variables was assessed using the Kolmogorov-Smirnov test. In cases where variables did not conform to a normal distribution, nonparametric statistical techniques were preferred to obtain reliable results. Differences between two independent groups were analyzed with the Mann-Whitney U test. Descriptive data

DOI: 10.5455/medscience.2026.01.031

are presented as median values along with the interquartile range (IQR, 25th-75th percentiles). Relationships between variables were evaluated using Spearman correlation analysis. Categorical variables were compared using the Chi-square test, and when relevant, risk measures such as odds ratios (OR) and relative risks (RR) were calculated. Interobserver reliability was determined using the Intraclass Correlation Coefficient (ICC) [10].

Results

A total of 72 YouTube videos were analyzed. Of these videos, 42 (58.3%) were uploaded by individual users, while 30 (41.7%) were uploaded by institutional sources. Among the analyzed videos, 17 focused on femoral catheter training, 20 on subclavian catheter training, 28 on jugular catheter training, and 7 included content related to the placement of at least two of these catheter types. The quantitative data demonstrated a nonparametric distribution.

The median and interquartile range (IQR; 25th-75th percentile) values of all quantitative variables were as follows: number of subscribers 32,100 (1,935-102,000), views 76,500 (4,125-186,500), likes 483 (60-1,375), video duration 6.53 minutes (3.11-10.02), GQS score 3 (3-4), JAMA score 2 (2-3), DISCERN score 44 (32-60), and cvcOSATS score 3 (3-4). These data are presented in Table 1.

Table 1. Median and 25%-75% (IQR) values of quantitative data

Variables	n	Median	IQR		Kolmogorov-Smirnov
			25%	75%	P value
Subscriber	72	32100	1935	102000	0.0001
Views		76500	4125	186500	0.0001
Like		483	60	1375	0.0001
Duration		6.53	3.11	10.02	0.0001
GQS		3	3	4	0.0001
JAMA		2	2	3	0.0001
DISCERN		44	32	60	0.014
cvcOSATS		3	3	4	0.0001

GQS: Global Quality Scale, JAMA: Journal of the American Medical Association, cvcOSATS: Central Venous Catheter-Objective Structured Assessment of Technical Skills

For all scales, inter-rater reliability was assessed using Cronbach's alpha coefficient and the ICC, calculated with a two-way mixed-effects model based on the definition of absolute agreement. For the GQS, we observed high internal consistency (Cronbach's alpha = 0.851). Inter-rater agreement was at a good level; the ICC was calculated as 0.735 for single measurements (95% CI: 0.607-0.826) and 0.847 for average measurements (95% CI: 0.755-0.905) ($p < 0.001$). For the JAMA scoring system, Cronbach's alpha was 0.816, indicating good internal consistency. We determined that inter-rater agreement was at a moderate-to-good level; the ICC was 0.690 for single measurements (95% CI: 0.547-0.794) and 0.817 for average measurements (95% CI: 0.707-0.885) ($p < 0.001$). The DISCERN scale demonstrated excellent internal consistency (Cronbach's alpha = 0.968). We observed very high inter-rater agreement; the ICC was calculated as 0.939 for single measurements (95% CI: 0.904-0.961) and 0.969 for average measurements (95% CI: 0.950-0.980) ($p < 0.001$). For the cvcOSATS score, Cronbach's alpha was 0.869, indicating high internal consistency. ICC results demonstrated good agreement; the ICC was calculated as 0.769 for single measurements (95% CI: 0.656-0.849) and 0.870 for average measurements (95% CI: 0.792-0.918) ($p < 0.001$). Overall, we achieved inter-rater reliability ranging from good to excellent across all assessment tools, supporting the reproducibility of the scoring process. Inter-rater reliability results evaluated using Cronbach's alpha coefficients and the Intraclass ICC are presented in Table 2.

Table 2. Inter-rater reliability analysis of the scoring systems

Scale	n	Cronbach's Alpha	ICC (Single measures)	95% CI	ICC (Average measures)	95% CI	p-value
GQS	72	0.851	0.735	0.607-0.826	0.847	0.755-0.905	<0.001
JAMA	72	0.816	0.690	0.547-0.794	0.817	0.707-0.885	<0.001
DISCERN	72	0.968	0.939	0.904-0.961	0.969	0.950-0.980	<0.001
cvcOSATS	72	0.869	0.769	0.656-0.849	0.870	0.792-0.918	<0.001

GQS: Global Quality Scale, JAMA: Journal of the American Medical Association, cvcOSATS: Central Venous Catheter-Objective Structured Assessment of Technical Skills, ICC: Intraclass Correlation Coefficient

DOI: 10.5455/medscience.2026.01.031

We classified the videos into two groups according to uploader type: individual and institutional. We found statistically significant differences between the groups in terms of subscriber count ($p < 0.001$) and view count ($p = 0.033$), with higher values observed in institutional videos for both variables. In contrast, we did not identify a statistically significant difference between the groups with respect to the number of likes ($p = 0.104$) or video duration ($p = 0.084$).

When educational quality metrics were evaluated, we observed statistically significant differences between the groups for GQS ($p < 0.001$), JAMA ($p = 0.004$), DISCERN ($p < 0.001$), and cvcOSATS ($p = 0.018$) scores. We found that all of these scores were higher in videos uploaded by institutional sources. These findings are presented in Table 3. The distribution of DISCERN classifications according to uploader type is illustrated in Figure 1.

Table 3. Comparison of videos by uploader type based on quantitative data

Variables	Loader	n	p value	Mean Rank	Standard Deviation
Subscriber	**Individual**	42	0.0001	129092	251955
	Institutional	30		222928	327870
Views	**Individual**	42	0.033	248367	686520
	Institutional	30		248053	342311
Like	**Individual**	42	0.104	1332	2521
	Institutional	30		1842	3442
Duration	**Individual**	42	0.084	7.92	6.54
	Institutional	30		9.86	8.01
GQS	**Individual**	42	0.0001	3.42	0.98
	Institutional	30		4	0.74
JAMA	**Individual**	42	0.004	2.36	0.86
	Institutional	30		2.7	0.83
DISCERN	**Individual**	42	0.0001	45.2	16
	Institutional	30		53.2	13.2
cvcOSATS	**Individual**	42	0.018	3.47	1.08
	Institutional	30		3.83	1.05

GQS: Global Quality Scale, JAMA: Journal of the American Medical Association, cvcOSATS: Central Venous Catheter-Objective Structured Assessment of Technical Skills

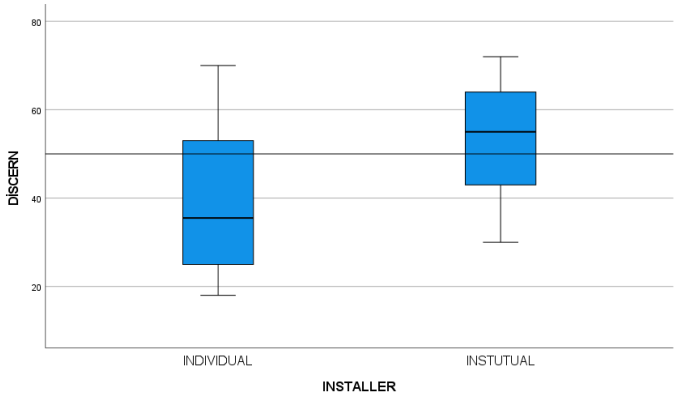

Figure 1. Comparison of DISCERN scores between individual and institutional YouTube videos

In the correlation analysis of our quantitative data, we identified moderate-to-high positive correlations among subscriber count, view count, and number of likes. We observed a moderate positive correlation between subscriber count and view count ($r = 0.571$, $p < 0.001$). Similarly, we found a moderate positive correlation between subscriber count and number of likes ($r = 0.512$, $p < 0.001$). We also identified a high positive correlation between view count and number of likes ($r = 0.873$, $p < 0.001$).

We observed a high positive correlation between video duration and GQS score ($r = 0.642$, $p < 0.001$). In addition, we found moderate-to-high positive correlations between video duration and JAMA ($r = 0.534$, $p < 0.001$), DISCERN ($r = 0.738$, $p < 0.001$), and cvcOSATS scores ($r = 0.627$, $p < 0.001$).

We identified strong relationships among the content quality scales. Specifically, we observed a very high positive correlation between GQS and DISCERN scores ($r = 0.836$, $p < 0.001$). Similarly, we found a very high positive correlation between DISCERN and cvcOSATS scores ($r = 0.851$, $p < 0.001$). We also identified a high positive correlation between GQS and cvcOSATS scores ($r = 0.777$, $p < 0.001$). Moderate-to-high positive correlations were observed between the JAMA score and DISCERN ($r = 0.721$, $p < 0.001$) and cvcOSATS ($r = 0.576$, $p < 0.001$) scores.

DOI: 10.5455/medscience.2026.01.031

We observed weak but statistically significant positive correlations between subscriber count and DISCERN (r = 0.239, p = 0.043) and JAMA (r = 0.272, p = 0.021) scores. However, we did not identify a significant relationship between subscriber count and GQS or cvcOSATS scores (p > 0.05). The relationships between cvcOSATS and the other quality scales are presented in Table 4.

Table 4. Correlation table between video cvcOSATS and quality scales

Parameters		n	r	p value
GQS			0.777	0.0001
JAMA	cvcOSATS	72	0.576	0.0001
DISCERN			0.851	0.0001

GQS: Global Quality Scale, JAMA: Journal of the American Medical Association

Discussion

YouTube is currently one of the largest video-sharing platforms. In recent years, it has offered free educational health-related videos for both healthcare professionals and patients. However, videos uploaded to YouTube are generally not reviewed by subject-matter experts and often remain inadequate in terms of reliability. Previous studies evaluating the safety and quality of YouTube videos have demonstrated that such analyses are rare for certain topics, including CVC placement [5].

Most of the videos included in our study were uploaded by individual users, whereas a smaller proportion were uploaded by institutional sources. In the literature, there are also studies on educational videos reporting higher numbers of uploads by either individual users or institutional sources. In our study, the higher number of videos uploaded by individual users may be attributed to factors such as the difficulty of obtaining ethics committee approval, legal responsibilities, and copyright concerns associated with institutional production. Additionally, institutional users may refrain from producing content because their materials are expected to be more comprehensive and formal in presentation, which may limit content generation [11,12].

We found that subscriber count and view count were significantly higher in videos uploaded by institutional sources compared with those uploaded by individual users.

The higher subscriber and view counts observed in videos shared by institutional uploaders may be related to these channels having a natural and sustained audience base, such as students and healthcare professionals. In addition, the higher perceived reliability of institutionally produced educational videos may contribute to viewers' preference for such content and encourage them to follow the entire channel. The regular production and availability of a large number of educational videos by institutional channels may also foster expectations of future access to similar content, thereby promoting subscription behavior.

When educational quality metrics were evaluated, we observed statistically significant differences between groups for GQS, JAMA, DISCERN, and cvcOSATS scores, with all scores being higher in institutional videos. The literature likewise reports higher quality scores for videos uploaded by institutional sources. Consistent with previous studies, we found that videos produced by institutional users achieved higher quality scores in our analysis. These findings suggest that institutional uploaders adopt a more professional approach to video production and aim to provide viewers with more scientifically grounded information [9,13,14].

Video duration showed significant and strong associations with content quality scores. Previous studies have similarly reported that quality scores increase as video duration becomes longer. The increase in quality scores with longer video duration may be related to the greater likelihood that longer videos address the topic more comprehensively, including diagnosis and treatment, indications and contraindications, complications, and procedural steps in a more systematic manner, as well as their increased capacity to cover details required by viewers [15,16].

Most of the analyzed videos focused on internal jugular catheter training, followed by content related to subclavian and femoral catheterization. The choice of insertion site depends on patient characteristics, clinical context, and operator expertise. Previous literature has demonstrated differences in complication profiles among access sites, including higher infectious risk associated with femoral catheterization in adult patients [17]. In line with current Centers for Disease Control and Prevention (CDC) guidelines, femoral venous access should be avoided when possible in non-emergent settings due to its increased risk of catheter-related bloodstream infection compared with internal jugular or subclavian access [18]. However, no approach is universally superior, as each technique carries procedure-specific risks, such as pneumothorax with subclavian access or mechanical complications with internal jugular insertion. The predominance of jugular catheter videos may therefore reflect its balanced risk profile and widespread clinical use. Conversely, the relatively higher infection and thrombosis risks reported for femoral catheterization may contribute to its more limited educational representation in digital platforms.

DOI: 10.5455/medscience.2026.01.031

Conclusion

This study was conducted to evaluate the educational quality and reliability of CVC training videos available on the YouTube platform. Our findings indicate that the analyzed videos generally demonstrated a moderate level of educational quality. The GQS and DISCERN scores of the videos included in our study fell within the moderate to moderate high range, suggesting that these videos may be used as supplementary resources in the education of healthcare professionals. On the other hand, the lower JAMA scores point to important deficiencies, such as the lack of source citation, limited content transparency, and issues related to content currency. Therefore, careful selection of videos and their evaluation from a critical perspective are essential when using them for educational purposes.

We found that videos uploaded by institutional sources (universities, hospitals, and professional organizations) had higher educational quality and reliability scores compared with those produced by individual content creators. These higher scores may be attributed to the more systematic preparation of institutional content and its greater adherence to scientific standards. Popularity indicators such as view count, number of likes, and subscriber count did not reflect video quality. Although weak but statistically significant correlations were observed between subscriber count and certain quality metrics, the low correlation coefficients indicate limited practical relevance. Therefore, popularity indicators cannot be considered reliable or strong predictors of educational quality. Educational value should instead be assessed using structured, validated evaluation tools. The positive association identified between video duration and educational quality scores suggests that longer videos are more likely to address the topic in a more detailed and comprehensive manner.

In addition, the higher frequency of videos focusing on jugular catheterization among the analyzed content may be interpreted as a reflection of this approach being safer and more commonly preferred in clinical practice, which is also mirrored in digital educational materials. In conclusion, CVC-related videos on YouTube may serve as a useful tool to support the education of healthcare professionals when appropriately selected and critically appraised. However, such content should not be considered sufficient on its own, should not replace guideline-based training, and preference should be given to videos produced by reliable institutional sources.

Limitations

This study has certain limitations that should be acknowledged when interpreting its results. First, the evaluation was restricted exclusively to content available on the YouTube platform; therefore, the findings may not be directly applicable to videos hosted on other educational or social media platforms. Second, the analysis represents a snapshot in time, as video data were collected at a single time point. Consequently, later uploads, deletions, or updates may have altered the overall distribution and quality of available content. Third, the inclusion of only videos with English narration or subtitles may have introduced language-related selection bias and may limit the broader international applicability of the findings.

Moreover, although validated assessment tools such as the JAMA benchmark criteria, GQS were employed, complete elimination of evaluator subjectivity was not possible. In addition, the study focused solely on CVC videos and and did not assess other vascular access procedures or related interventions.

Despite these limitations, the relatively large sample size, the use of standardized scoring instruments, and the multi-observer evaluation design enhance the overall robustness and reproducibility of the study.

Ethical Approval

Since the study involved only the analysis of publicly accessible online videos, no patient-related information was collected, and no invasive or interventional procedures were performed. Therefore, institutional ethics committee approval was not required.

Patient Consent

Not applicable. This study analyzed publicly accessible YouTube videos and did not involve patients, identifiable personal data, or human participants

Conflict of Interest

The authors confirm the absence of any conflicts associated with this work.

Funding

The authors declare that they have received no financial support for the study.

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