Original Article

Intramuscular drug administration: characterization of Brazilian videos on YouTube®*

Administração de medicamentos por via intramuscular: caracterização dos vídeos brasileiros veiculados no YouTube®

Luana Gabriele Souza Alves[1]
Patricia Magnabosco[2]
Simone de Godoy[1]
Bruna Franciele Toneti[1]
Leila Maria Marchi-Alves[1]

[1]Universidade de São Paulo, Escola de Enfermagem de Ribeirão Preto. Ribeirão Preto, SP, Brazil.
[2]Universidade Federal de Uberlândia. Uberlândia, MG, Brazil.

Corresponding author:
Leila Maria Marchi-Alves
Avenida dos Bandeirantes, 3900, Monte Alegre.
Escola de Enfermagem de Ribeirão Preto da
Universidade de São Paulo. CEP: 14.040-902
Ribeirão Preto, SP, Brazil.
E-mail: lmarchi@eerp.usp.br

EDITOR IN CHIEF: Ana Fatima Carvalho Fernandes
ASSOCIATE EDITOR: Bianka Sousa Martins Silva

ABSTRACT

Objective: to characterize videos that contain a demonstration of the procedure for administering drugs intramuscularly to adults. **Methods**: a descriptive cross-sectional study, 44 Brazilian videos available on YouTube® were selected which addressed the procedure of intramuscular drug administration. **Results**: the majority of the videos selected are of personal origin (86.4%), were made by a Nursing technician (59.1%), used the dorsal gluteal region as the injection spot (54.5%), and were produced in a healthcare environment using a patient to demonstrate the procedure (52.3%). No video showed the completeness of the procedure, and a high frequency of errors was identified at all stages of the procedure. There was a statistically significant difference between the reliability and popularity tests of the videos (p=0.042). **Conclusion:** the videos on intramuscular drug administration available on the YouTube® platform were considered to be up-to-date, of little relevance, produced by unreliable sources, of low accuracy, and with a weak purpose. **Contributions to practice:** the videos available on the YouTube® platform on intramuscular drug administration should not be used as educational material for professional training or updating.
Descriptors: Injections, Intramuscular; Instructional Film and Video; Drug Administration Routes; Patient Safety; Internet Use.

RESUMO

Objetivo: caracterizar os vídeos que contém a demonstração do procedimento de administração de medicamentos por via intramuscular em indivíduos adultos. **Métodos**: estudo de corte transversal descritivo, foram selecionados 44 vídeos brasileiros disponíveis no *YouTube*® que abordavam o procedimento de administração de medicamentos por via intramuscular. **Resultados**: a maioria dos vídeos selecionados é de origem pessoal (86,4%), tem como autor um técnico de Enfermagem (59,1%), adota a região dorsoglútea como local de injeção (54,5%), foi produzido em ambiente de saúde utilizando um paciente para a demonstração do procedimento (52,3%). Nenhum vídeo apresentou a completude do procedimento, sendo identificada grande frequência de erros em todas as etapas do procedimento. Observou-se uma diferença estatisticamente significante entre os testes de confiabilidade e popularidade dos vídeos (p=0,042). **Conclusão:** os vídeos que abordam o procedimento de administração de medicamentos por via intramuscular disponíveis na plataforma *YouTube*® foram considerados atuais, de pouca relevância, elaborados por fontes não confiáveis, de baixa acurácia e frágil finalidade. **Contribuições para a prática:** os vídeos disponíveis na plataforma *YouTube*® sobre a administração de medicamentos por via intramuscular não devem ser indicados como material educativo para a formação ou atualização profissional.
Descritores: Injeções Intramusculares; Filme e Vídeo Educativo; Vias de Administração de Medicamentos; Segurança do Paciente; Uso da Internet.

Introduction

The administration of medicines is one of the functions assigned to the Nursing team, carried out by nurses, technicians, and Nursing assistants under the supervision of the nurse. Knowledge of the indication, the action of the drug, the route of administration, and the potential risks offered is essential[1].

Among the routes of drug administration, intramuscular is commonly used in care, due to the rapid drug absorption due to the greater vascularization of the muscles, which involves a set of complex decisions about the volume of medication to be injected, the drug, the technique, the site to be used for the application and the necessary supplies, as well as aspects relating to the patient[2].

However, medication errors occur every day and can result in death, sequelae, and hospitalization[2]. In view of the problem related to errors in the medication administration process and their direct influence on patient safety, there is a need to identify the weaknesses involved in the preparation and administration of intramuscular medication, making it possible to implement prevention and control measures. The use of educational videos is one of the strategies to improve professionals' skills and knowledge of the procedure[3].

The production of educational videos has been boosted by the digital age, and their use has been driven by technological advances. Today, there are various media on the Internet with the aim of disseminating content for educational purposes beyond formal educational strategies, and different content-sharing actions can be carried out on digital social media, enhancing communication and the dissemination of information, allowing for the dynamic, interactive, open and creative development of teaching and learning strategies[3-4].

Thus, the Internet has become a widely used source for obtaining health information, both by laypeople and professionals. This is particularly significant considering that Brazil has the fifth largest population of social media users and the second largest outside Asia. Among the most popular social media platforms in Brazil is YouTube®[5].

YouTube® is an online video-sharing platform that allows the creation and free, unlimited consumption of video content via streaming. Open access and widely used, it has become the global leader in worldwide mobile traffic[6]. Available in more than 100 countries and with 2.56 billion monthly active users, the typical user consumes 23.7 hours per month using this application[7]. In Brazil, the user base in 2021 was approximately 146.8 million users, with the prospect of reaching more than 166 million people by 2025[8]. With these impressive figures, the platform has become an essential source of information and can be a useful tool for informing the public and improving the learning experience, if used properly[9].

However, even though a lot of educational and useful health information is found, the number of videos containing misleading information is quite high, and it is difficult for the user to distinguish the published materials as useful or harmful since there is no preliminary assessment in terms of the accuracy and reliability of the content[10].

For this reason, there are studies investigating the quality of health videos in almost all fields of health and Nursing[11-12]. However, there has been a lack of research into the quality of videos designed to teach and/or demonstrate the procedure for administering drugs intramuscularly.

In view of the above, in order to recognize the content, reliability, and popularity of the material made available on the platform, we aimed to characterize videos that contain a demonstration of the procedure for administering drugs intramuscularly to adults.

Methods

This was a descriptive cross-sectional study, with a sample made up of videos available on the YouTube® platform (https://www.youtube.com) which demonstrated the procedure for administering drugs intramuscularly to adults, and which were publi-

cly available and in Portuguese. Videos duplicated in whole or in part, those not produced in Brazil, those produced for the pediatric field, for non-therapeutic purposes, those not intended for professional Nursing education, animated videos, those that did not address the content pertinent to the topic studied, those presented by students, short videos (one minute or less in length), remote classes or live broadcasts were excluded.

The data was collected from November 2022 to February 2023 and the videos were searched using the controlled descriptors: "intramuscular injections"; "Nursing", extracted from the Health Sciences Descriptors. The filters "type of result", "upload date" and "characteristics", offered by the site itself, were used, selecting the "video" option. There was no time frame. At the time, the videos were first viewed by two researchers in the field in order to check their compatibility with the stipulated inclusion criteria.

The selection, analysis, and extraction of data were carried out independently by researchers in the field, with the aim of minimizing possible research bias. When there was a divergence in the analysis, a third specialist was consulted.

The selected videos were analyzed using the following tools: video characterization; the Currency, Relevance, Authority, Accuracy, and Purpose (CRAAP) reliability test[12-13]; video popularity analysis using the Video Power Index (VPI)[14]; and a tool containing the component steps of the intramuscular drug administration procedure.

These tools have been used by various authors for the same purposes[9-10,13-14]. To extract the data, an instrument previously prepared by the authors was used, containing the variables of the characteristics of the videos: authorship (individual, public or private institution); month and year of posting; duration (in minutes); number of views (indicated in the video description); number of likes and dislikes; professional category of the authors or protagonists of the videos, defined by self-declaration in the video, when it was not possible to identify them on the page they were posted.

The CRAAP test is a tool used to assist in the process of critically evaluating information. By using this test to evaluate sources, the researcher measures the reliability of the video content and reduces the likelihood of using unreliable information[14].

For each of the five domains of the CRAAP test (timeliness, relevance, authorship, accuracy, and purpose), the videos received between zero and three points. Each category was weighted equally. The maximum score was 15 points. A final score of zero to three points indicates a questionable and probably unreliable source of information; a score of four to seven points indicates that the information may be reliable, but requires caution; a score of eight to 11 points indicates a good source of information; and 12 to 15 points indicates an excellent source of information[12,15]. They can also be classified as a very questionable source that should not be consulted (zero to three points); a source that can be consulted but should not be cited (four to seven points); a good source for consultation and citation (eight to 11 points), and an excellent source for consultation and citation (12 to 15 points)[16].

A tool was also developed containing the stages of the intramuscular drug administration procedure, which can be defined as a checklist. This tool was developed by the authors on the basis of the literature (scientific articles and textbooks, including the best evidence) and consultation of documents containing the guidelines, directives, and standards made available by official bodies accessible in the literature, and submitted to the appreciation of two researchers in the field. The instrument covered aspects related to the procedure of administering drugs intramuscularly for therapeutic purposes in adult patients.

The instrument, made up of 34 domains, contains items relating to the stages of preparing the patient and the medication (01 to 13), administering the medication (14 to 28), and post-administration of the medication (29 to 34). In addition to the specific actions recommended for intramuscular injection, with the adoption of the nine keys to safe drug administration[2], the International Patient Safety Goals[1] were observed, as well as the standard precautions and the

use of Personal Protective Equipment in force[17].

Each domain of the instrument included the following answers: performed correctly (C); performed incorrectly (I); not performed (NP); and not applicable (NA). It should be pointed out that the answer "not performed" can mean "not presented". As there is no way of recognizing whether the authors of the videos omitted some of the information by mistake or choice (videos with an erroneous, partial, or incomplete demonstration of the procedure), any item not demonstrated was considered to be "not performed". It should be noted that quality educational material must contain the entire procedure.

The popularity of the video was assessed using the Video Power Index (VPI). First, to avoid bias in the period of a video on YouTube®, the proportions of views and likes were observed. The following parameters were determined: a) proportion of likes: number of likes ×100 / (number of likes + number of dislikes) and b) proportion of views: number of views/time since upload (days)[13]. VPI scores were calculated using the following formula: proportion of likes x proportion of views/100[18-19].

The data was analyzed using descriptive statistics (mean, standard deviation, frequency, percentage, minimum, and maximum), using SPSS, version 25.0. The normal distribution of quantitative data was assessed using the Kolmogorov-Smirnov test. Spearman's correlation test was used to assess the correlation between continuous variables (CRAAP and VPI scores). Analysis of variance (ANOVA) was used to compare the three groups of the CRAAP reliability test (questionable/unreliable source; source requiring caution and good source) and Bonferroni's multiple comparisons test was used. Variables were expressed as mean ± standard deviation and $p<0.05$ was considered statistically significant.

Results

A total of 371 videos were examined, of which 19 (5.1%) were removed for being duplicates. After being judged by the inclusion and exclusion criteria,

308 of them were removed: 205 (55.3%) did not contain a demonstration of the intramuscular drug administration procedure; 60 (16.2%) were not intended for professional Nursing teaching; 12 (3.2%) were animated videos; 10 (2.7%) had the practice carried out by students; nine (2.4%) for non-therapeutic purposes; nine (2.4%) short videos; seven (1.9%) for the pediatric area; three (0.8%) live broadcasts or remote classes; two (0.5%) incomplete videos; one (0.3%) not publicly available. For some videos, more than one exclusion criterion was identified. In total, 44 videos were included in the sample.

The general characteristics of the videos, according to their nature, material content, duration, user behavior, content reach, and popularity are provided in Table 1.

Table 1 – Characteristics of Brazilian videos on intramuscular drug administration on YouTube® (n=44). Ribeirão Preto, SP, Brazil, 2023

Variable	n (%)	Mean ± Standard Deviation	Confidence Interval
Type of video			
Personal	38 (86.4)	–	–
Institutional	6 (13.6)	–	–
Author/protagonist's professional category			
Nursing technician	26 (59.1)	–	–
Nurse	14 (31.8)	–	–
Not identified	4 (9.1)	–	–
Region of intramuscular injection			
Gluteal dorsum	24 (54.4)	–	–
Anterolateral aspect of the thigh	10 (22.7)	–	–
Ventrogluteal	7 (15.9)	–	–
Deltoid	6 (13.6)	–	–
Scenario			
Healthcare environment (patient)	23 (52.3)	–	–
Simulated (role-player)	13 (29.5)	–	–
Simulated (mannequin)	4 (9.1)	–	–
Home (patient or role-player)	4 (9.1)	–	–
Duration	–	0:06:39.7 ± 0:07:12.9	0:01:54.9 - 0:47:14.0
Number of likes	–	3.408.2 ± 6.120.4	07 – 28.000
Number of dislikes	–	79.9 ± 131.3	0 – 580
Number of views	–	86.112.3 ± 144.074.2	806 – 15.827
Time since upload (days)	–	920.3 ± 417.9	249 – 1.789
Proportion of likes*	–	97.2 ± 4.6	76.8 – 100.0
Proportion of views†	–	88.9 ± 129.4	1.3 – 608.4
Video Power Index‡	–	86.8 ± 127.8	1.3 – 596.0

*Proportion of likes: number of likes x 100/(number of likes + number of unlikes); †Proportion of views: number of views/upload time; ‡Proportion of likes x proportion of views/100

Of the institutional videos, two (33.3%) were produced by academic institutions. The time frame ranged from 2018 to 2022. Most of the videos selected prioritized verbal language, had a lecture format (39 or 88.6%), and were produced in-house, with the instructor self-recording. Few of them used text and images to illustrate the topic, and only three incorporated more differentiated resources in their production. None incorporated bibliographic citations of the material consulted.

The 44 videos together totaled 3,788,940 views, 149,962 likes and 3,518 dislikes. The distribution of points for each of the items assessed in the CRAAP test is shown in Table 2.

Table 2 – Absolute (n) and relative (%) frequency of the test domains (n=44). Ribeirão Preto, SP, Brazil, 2023

Criteria	Score			
	0	**1**	**2**	**4**
	n (%)	**n (%)**	**n (%)**	**n (%)**
Latest	-	1 (2.3)	39 (88.6)	4 (9.1)
Relevance	1 (2.3)	37 (84.1)	3 (6.8)	3 (6.8)
Authorship	28 (63.6)	10 (22.7)	4 (9.1)	2 (4.5)
Accuracy	41 (93.2)	3 (6.8)	-	-
Objective	28 (63.6)	12 (27.3)	2 (4.5)	2 (4.5)

The average CRAAP test score, considering all the videos, was 4.36 (± 2.09). Table 3 shows the descriptive data for IPV values according to CRAAP score classification.

A positive correlation was observed between the VPI and CRAAP test results (0.143), with no statistically significant difference between the variables (p=0.354). There was a statistically significant difference (p=0.042) in the mean VPI value between the three CRAAP score classification groups obtained for the videos studied (questionable/unreliable source, source requiring caution, good source), with the videos with questionable/unreliable sources differing from those with sources requiring caution, according to the Bonferroni test (p=0.043).

The proportions of likes and dislikes according to the number of views in each category of the CRAAP test are shown in Table 4.

Table 4 – Proportions of likes and dislikes according to the number of views in each category of the Currency, Relevance, Authority, Accuracy, and Purpose reliability test. Ribeirão Preto, SP, Brazil, 2023

Variables	Questionable/ unreliable source (n=23)	Source requiring caution (n=17)	Good source (n=4)	Total (n=44)
	n (%)	**n (%)**	**n (%)**	**n (%)**
Views	1,342,371 (100.0)	2,274,925 (100.0)	171,644 (100.0)	3,788,940 (100.0)
Likes	41,648 (3.1)	103,548 (4.5)	4,766 (2.78)	149,962 (100.0)
Dislikes	1,971 (0.15)	1,471(0.06)	76 (0.04)	3,518 (100.0)

Table 3 – Minimum, maximum, mean, and standard deviation values of Video Power Index according to test score classification. Ribeirão Preto, SP, Brazil, 2023

CRAAP* Test	Video Power Index					p-value[†]
	n (%)	**Minimum**	**Maximum**	**Mean**	**Standard deviation**	
Questionable/unreliable source	23 (52.3)	1.3	142.3	47.9	30.9	
Source that requires caution	17 (38.6)	1.3	596.0	147.1	189.8	0.042
Good source	4 (9.1)	14.9	101.1	54.3	37.1	
Total	44 (100.0)	1.3	596.0	86.8	127.8	

*CRAAP: Currency, Relevance, Authority, Accuracy, and Purpose; [†]Analysis of Variance (ANOVA)

The 44 videos in the sample totaled 1,460 evaluations for the 34 checklist criteria for the intramuscular drug administration procedure. When considering each stage of the procedure, there were a total of: 572 evaluations for the 13 criteria of the patient/medication preparation stage; 660 evaluations for the 15 criteria of the medication administration stage, itself, and 264 evaluations for the six criteria of the post-drug administration stage. The distribution and average of the number of criteria or items carried out correctly, not carried out or not mentioned and carried out incorrectly, according to the stages of the procedure, were then presented (Table 5).

Table 5 – Distribution of the mean and number of items performed correctly, not performed or not mentioned and performed incorrectly (n=1,496), according to the stages of the intramuscular drug administration procedure (n=44 videos). Ribeirão Preto, SP, Brazil, 2023

Variables	Procedure steps		
	Preparing the patient/ medication	Drug administration	Post-administration
	n (%)	n (%)	n (%)
Number of items carried out correctly	85 (14.9)	248 (37.6)	23 (8.7)
Number of items not carried out/mentioned	491 (85.8)	198 (30.0)	241 (91.3)
Number of items performed incorrectly	48 (9.8)	262 (39.7)	84 (31.8)
Total	572 (100.0)	660 (100.0)	246 (100.0)
	Mean ± standard deviation	Mean ± standard deviation	Mean ± standard deviation
Average number of items performed correctly per video	1.93 ± 2.39	5.64 ± 2.91	0.52 ± 1.32
Average number of items not performed/mentioned per video	9.20 ± 2.21	4.50 ± 2.30	5.48 ± 1.32
Average number of items performed incorrectly per video	1.09 ± 1.29	5.95 ± 2.40	1.91 ± 0.29

In the patient and drug preparation stage, in 11 (25%) of the videos, no criterion was performed correctly. Also in the post-drug administration stage, 34 (77.3%) videos had all the items carried out incorrectly or not at all.

With regard to failures relating to patient care, the failure to recognize anatomical structures for delimiting the injection area was almost unanimous. As an example, the concept of division into quadrants was used in all the procedures in which demarcation of the application site in the dorsal gluteal region was demonstrated. In two of the videos selected, the injection was carried out in an area with a large hematoma caused by previous procedures, as reported by the practitioner him/herself.

With regard to the preparation of medicines, the main inconsistencies were observed in the knowledge of the principles of asepsis and the handling of sterile material, such as breaking the packaging of syringes and needles to the detriment of using the opening petals; using the syringe packaging as a protector when opening ampoules; contamination of the plunger during the preparation and administration of medicines.

Inadequate practices, such as the use of procedural gloves to prepare medicines, the use of material without safety devices, and the active re-capping of the needle during the preparation of the medicine, are also worth mentioning.

Errors in written and verbal language (spelling, grammar) and inappropriate use of scientific terminology are also noteworthy.

Discussion

The videos listed in this investigation can be considered long (longer than six minutes and shorter than 20). The literature suggests that interactive instructional videos should last between 20 seconds and two minutes, because the longer the video, the greater the chance of the viewer losing concentration[20]. But in order to achieve high quality, the running time must also be long enough to convey verbally or in writing what the scoring system criteria require[13].

In this study, some variables were used to measure popularity and also showed the results regarding content reach and user behavior.

It should be noted that, although for the platform popularity is a criterion that takes into account the number of subscribers to each channel, with videos with the highest number of views being better classified, it has already been suggested that the popularity of the authors of the videos is correlated to the popularity of the videos, indicating that part of the accesses to the videos come from social relationships established on the network[21] and not from the quality of the material published.

From this perspective, 200 of the most popular asthma videos posted on YouTube® revealed that videos are popular in terms of viewer interaction, but popularity is not restricted to videos uploaded by professional sources. Although more than half of the videos were considered useful, a considerable proportion were judged to be of misleading quality[22].

It is worth pointing out that YouTube® should improve its rating and recommendation system to promote content with stronger attributes because, in some ways, social media platforms fill the gap in users' lack of knowledge by providing a learning perspective in anonymity but offering unlimited options for minimally questionable information[23].

When considering the overall sample here, the average score of the CRAAP test was 4.36 (± 2.09), indicating a source that can be consulted but should not be cited[16]. The "accuracy" domain is the most compromised, receiving "zero" points in 93.2% of the sample. The material is of low accuracy because the rigor, reliability, and correctness of the information were found to be compromised, as well as containing spelling and grammar errors; the explanations are not supported by scientific evidence and are not verifiable, since if there was a supporting bibliography, the references were omitted.

Thus, the score for each of the videos in the same test, i.e. the majority (52.3%), was considered a questionable and probably unreliable source of information[12,15]. In short, the score obtained in the CRAAP test indicates that the videos evaluated are current, of little relevance, made by unreliable authors or without expertise in the subject, and of low accuracy and fragile purpose[15]. It should be noted that in this investigation, the CRAAP test score was not lower only because, in general, the videos selected were considered recent, having been available on the platform for less than five years.

Similarly, when evaluating the quality of videos related to breast cancer, the researchers extracted data from the top 200 most viewed videos on the platform and found that 53% were considered bad or terrible, concluding that YouTube® is a limited tool to be used in the process of educating women about breast cancer control[24].

Conversely, a study that used the same tool to critically evaluate information analyzed educational videos on needle pain management that are publicly available and found that most of the videos were current (96%), relevant (100%), produced by a reliable source (76% in terms of authorship) and all were accurate, with a purpose related to the content[25]. On the other hand, videos related to early abortion and used as a tool for patient education, 74 videos were evaluated and had an average CRAAP test score of 8.3, indicating good quality sources, but that they do not reach the academic level[12].

Regarding the quality and scientific accuracy of health information available on platforms, it has been discussed that YouTube® brings information with

contradictory reference standards/guidelines, but has the potential to change consumers' beliefs about controversial issues. Social media is capable of helping to close the gap in health literacy; however, despite this opportunity, there is the likelihood of inaccurate and even harmful information being disseminated[26], as was identified here.

These findings indicate that the difference between the popularity and quality of videos is a matter of debate. It is understood that there is a need for a better explanation, on the part of the sharing platform, about the source's credibility, the material made available, and the information disseminated. In addition, health professionals should be instructed to recognize whether the content resulting from the search has been prepared by qualified personnel, with knowledge in the field, mastery of the subject and prepared from reliable, safe sources of information, showing current scientific evidence and, if possible, previously evaluated by the available scoring systems.

Therefore, Initiatives must be taken to enhance the potential of YouTube as a valuable resource for teaching intramuscular drug administration, which can be extrapolated to other areas of Nursing and health, in order to mitigate the promulgation of derogatory images of professionals.

When analyzing the 112 most viewed videos about urinary incontinence on YouTube®, evaluated by two researchers from different courses[23], it was observed that the average comprehensibility and accessibility scores were 57.9% and 44.7%, respectively. None of the metadata (likes, dislikes, view count, comment count, video length) was related to the scores of the instrument used to evaluate the health education material.

Under the same perspective, a study estimating the quality and accuracy of 50 videos on the vestibular approach to endoscopic thyroidectomy published on YouTube® also found negative correlations between VPI scores and educational value, transparency, and technical quality[13]. There was no correlation between video views, like rates, and video predicates[27].

Also, in another study, parameters such as the number of likes and dislikes, comment counts, and VPI were not correlated with video quality[28].

In general, YouTube® videos that address health issues show that the popularity of videos decreases when the source of the videos is academic[18-19]. The low level of interest in social media among higher education professionals, such as doctors, may be the reason why videos with high content scores are less numerous and overshadowed by lower-quality videos[27].

In the sample analyzed, no video showed the completeness of the procedure, correctly performing or mentioning all the items in each stage. It is understood that the correct procedure should cover all the items that make up the stages of preparing the patient and the medication, administering the medication, and post-administration of the medication in an integral and error-free manner, since, like all Nursing actions, intramuscular injections require a complete and meticulous approach to assessing the patient and the safe technique[29].

Nurses need to develop technical competence and knowledge in order to carry them out. The professional must know the possibilities of planning them, whether through protocols, routines, or standards of guidance, and know how to recognize the expected results of the action in order to identify the possible adverse effects resulting from the act performed[1]. When considering the diversity of actions that these professionals can carry out, the importance of the Nursing team's role in the context of drug safety is evident, so all actions must be implemented with the aim of promoting and preserving patient safety[30].

Study limitations

This investigation was limited to evaluating only a fraction of the videos available on the platform, and the selection was limited by the time of the search. The findings may also have been influenced by the descriptors chosen to screen the videos. It is not pos-

sible to be sure that the content producers have created titles and descriptions that respond efficiently to their users' searches, or that the right keywords have been used to reach the content of interest.

Another limiting factor was the difficulty in identifying the purpose of the video in order to classify it. Although, in this investigation, the material analyzed may have the characteristics of a video lesson, it was not possible to classify them accurately, because in some media there is a lack of crucial elements for this definition, especially the severe compromise of content, the lack of prior knowledge of the instructors, the use of inappropriate concepts, the insufficiency of information, the lack of definition of the target audience.

In addition, only videos produced in Brazil and published in Portuguese were included in the sample, and videos from other countries were not analyzed.

Contribution to practice

This research allowed an investigation into the quality and reliability of Brazilian videos posted on YouTube® that demonstrated the procedure for administering medication intramuscularly. The study could alert and help health professionals select educational materials published on the Internet based on criteria that are reliable and consistent with good practice based on scientific evidence. In this way, such content can be used as educational materials for learning how to administrate drugs intramuscularly, with a view to quality of care and patient safety.

Conclusion

The findings of this investigation indicate that most of the Brazilian videos on intramuscular drug administration available on the YouTube® platform have poor content, low accuracy, and reliability and should not be recommended as educational material for professional training or updating.

Authors' contribution

Conception and design or data analysis and interpretation: Alves LGS, Magnabosco P, Marchi-Alves LM.
Writing of the manuscript or relevant critical revision of the intellectual content: Alves LGS, Magnabosco P, Godoy S, Toneti BF, Marchi-Alves LM.
Final approval of the version to be published and responsibility for all aspects of the text in ensuring the accuracy and integrity of any part of the manuscript: Alves LGS, Magnabosco P, Godoy S, Toneti BF, Marchi-Alves LM.

References

1. Conselho Regional de Enfermagem de São Paulo. Segurança do paciente: guia para a prática [Internet]. 2022 [cited Jun 13, 2023]. Available from: https://portal.coren-sp.gov.br/wp-content/uploads/2022/05/Seguranca-do-Paciente-WEB.pdf

2. Nakajima Y, Fujii T, Mukai K, Ishida A, Kato M, Takahashi M, et al. Anatomically safe sites for intramuscular injections: a cross-sectional study on young adults and cadavers with a focus on the thigh. Hum Vaccin Immunother. 2020;16(1):189-96. doi: https://doi.org/10.1080%2F21645515.2019.1646576

3. Silva WS, Fonseca AR, Horta EG. O uso de vídeos do YouTube na educação. Rev Vozes Vales [Internet]. 2019 [cited Jul 15, 2023]. Avalable from: http://site.ufvjm.edu.br/revistamultidisciplinar/files/2019/10/Welington.pdf

4. Moreira JA, Santana CLS, González Bengoechea A. Teaching and learning in digital social networks: the MathGurl case on YouTube. Rev Comunic SEECI. 2019;(50):107-27. doi: https://dx.doi.org/10.15198/seeci.2019.50.107-127

5. Statista Research Department, STATISTA. Level of trust in media in Brazil from 2011 to 2022 [Internet]. 2022 [cited Jan 20, 2023]. Available from: https://www.statista.com/statistics/695784/media-trust-brazil/

6. The Global Internet Phenomena Report. Growing app complexity: paving the way for digital lifestyles

and immersive experiences [Internet]. 2022 [cited Jan 10, 2023]. Available from: https://www.sandvine.com/hubfs/Sandvine_Redesign_2019/Downloads/2022/Phenomena%20Reports/GIPR%202022/Sandvine%20GIPR%20January%202022.pdf

7. Datareportal. Digital 2022: global overview report [Internet]. 2022 [cited Feb 20, 2023]. Available from: https://datareportal.com/reports/digital-2022-global-overview-report

8. Degenhard J. Youtube users in Brazil 2017-2025. Statista [Internet]. 2021 [cited Jun 22, 2023]. Available from: https://www.statista.com/forecasts/1145585/youtube-users-in-brazil

9. Ferhatoglu SY, Kudsioglu T. Evaluation of the reliability, utility, and quality of the information in cardiopulmonary resuscitation videos shared on open access video sharing platform YouTube. Australas Emerg Care. 2020;23(3):211-6. doi: https://doi.org/10.1016/j.auec.2020.05.005

10. Cakmak G. Evaluation of scientific quality of YouTube video content related to umbilical hernia. Cureus 2021;13(4):e14675. doi: https://dx.doi.org/10.7759/cureus.14675

11. Margallo MCM, Mariano CNP, Martinez KNFL, Mariano RLT, Maramag LML, Mariano AAC, et al. Characterizing effective teaching in nursing pharmacology YouTube videos: a mixed methods study. Nurse Educ Today. 2023;120:e105624. doi: https://doi.org/10.1016/j.nedt.2022.105624

12. McNamee LA, Shakartzi H, Wasser TE, Li Y, Kim CS. Assessing the accuracy and quality of YouTube videos on early pregnancy loss. Heliyon. 2022;8(12):e11947. doi: https://dx.doi.org/10.1016/j.heliyon.2022.e11947

13. Blakeslee S. The CRAAP Test. LOEX Quarterly [Internet]. 2004 [cited Jan 10, 2023]. Available from: https://commons.emich.edu/loexquarterly/vol31/iss3/4

14. Yigit B, Citgez B. Assessment of the educational quality, accuracy, and transparency of websurg videos on minimally invasive video-assisted parathyroidectomy. Cureus. 2021;13(10):e18942. doi: https://doi.org/10.7759/cureus.18942

15. California State University. Meriam Library. Evaluating information: applying the CRAAP test [Internet]. 2010 [cited Feb 5, 2023]. Available from: https://library.csuchico.edu/sites/default/files/craap-test.pdf

16. Ron E. Lewis Library. Thinking critically about web information—applying the CRAAP test [Internet]. 2022 [cited Jan 10, 2023]. Available from: https://library.lsco.edu/help/web-page-rubric.pdf

17. Ministério do Trabalho e Emprego (BR). Portaria nº 806, de 13 de abril de 2022. Altera/atualiza a Norma Regulamentadora nº 32 (Segurança e Saúde no Trabalho em Estabelecimentos de Saúde) [Internet]. 2022 [cited Jan 10, 2023]. Available from: https://www.gov.br/trabalho-e-previdencia/pt-br/acesso-a-informacao/participacao-social/conselhos-e-orgaos-colegiados/ctpp/arquivos/normas-regulamentadoras/nr-32-atualizada-2022.pdf/view

18. Erdem MN, Karaca S. Evaluating the accuracy and quality of the information in kyphosis videos shared on YouTube. SPINE. 2018;43(22):1334-9. doi: http://doi.org/10.1097/brs.0000000000002691

19. Karagoz B, Bakir M, Kececi T. Evaluation of the accuracy and quality of information in videos about lateral epicondylitis shared on internet video sharing services. Cureus. 2022;14(2):e22583. doi: https://doi.org/10.7759/cureus.22583

20. Rossi MB, Baptista RCN, Ohla RIB, Domingus TAM, Barros ALBL, Lopes JL. Development and validation of educational videos addressing indwelling catheterization. J Nurs Educ Pract. 2019;9(3):109-17. doi: https://doi.org/10.5430/jnep.v9n3p109

21. Sakamaki Y, Tsuji M, Heidrick Z, Watson O, Durchman J, Salmon C, Burgin SR, Beyzavi H. Preparation and applications of metal–organic frameworks (MOFs): a laboratory activity and demonstration for high school and/or undergraduate students. J Chem Educ. 2020;97(4):1109-16. doi: https://doi.org/10.1021/acs.jchemed.9b01166

22. Diers CS, Remvig C, Meteran H, Thomsen SF, Sigsgaard T, Høj S, et al. The usefulness of YouTube videos as a source of information in asthma. J Asthma. 2023;60(4):737-43. doi: https://doi.org/10.1080/02770903.2022.2093218

23. Baran C, Baran SY. YouTube videos as an information source about urinary incontinence. J Gynecol Obstet Hum Reprod. 2021;50(10):102197. doi: https://doi.org/10.1016/j.jogoh.2021.102197

24. Villa LSC, Mello ADC, Gonçalves JV, Gomes da Silva TM, Bernuci MP. Avaliação da qualidade dos vídeos sobre câncer de mama mais visualizados no YouTube: relevância para promoção da saúde da mulher. Rev Eletr Comun Inf Inov Saúde. 2021;15(3):648-64. doi: https://dx.doi.org/10.29397/reciis.v15i3.2342

25. Farkas C, Solodiuk L, Taddio A, Franck L, Berberich FR, LoChiatto J, et al. Publicly available online educational videos regarding pediatric needle pain: a scoping review. Clin J Pain. 2015;31(6):591-8. doi: http://doi.org/10.1097/ajp.0000000000000197

26. Yurdaisik I. Analysis of the most viewed first 50 videos on YouTube about breast cancer. Biomed Res Int. 2020;2020:e2750148. doi: https://dx.doi.org/10.1155/2020/2750148

27. Mert A, Bozgeyik B. Quality and content analysis of carpal tunnel videos on YouTube. Indian J Orthop 2021;56(1):73-8. doi: https://doi.org/10.1007/s43465-021-00430-5

28. Yaradılmış YU, Evren AT, Okkaoğlu MC, Öztürk O, Haberal B, Özdemir M. Evaluation of quality and reliability of YouTube videos on spondylolisthesis. Interdiscip Neurosurg. 2020;22:e100827. doi: https://doi.org/10.1016/j.inat.2020.100827

29. Ogston-Tuck S. Intramuscular injection technique: an evidence-based approach. Nurs Stand. 2014;29(4):52-9. doi: https://doi.org/10.7748/ns.29.4.52.e9183

30. Camargos RGF, Azevedo C, Moura CC, Manzo BF, Salgado PO, Mata LRF. Safety protocol on medication prescription, use and administration: mapping of nursing interventions. Texto Contexto Enferm 2021;30:e20200511. doi: https://dx.doi.org/10.1590/1980-265X-TCE-2020-0511