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Brief Report

[Translated article] Deglufarm: Mobile application with recommendations for the safe administration of drugs in patients with dysphagia or swallowing disorders

Eva Delgado-Silveira[a,*], Patricia Bravo José[b], María Teresa Llanos García[c], Elena Alba Álvaro Alonso[d], María Muñoz García[a] and Francisco José Hidalgo Correas[e]

[a] Servicio de Farmacia, Hospital Universitario Ramón y Cajal, Irycis, Madrid, Spain
[b] Servicio de Farmacia Sociosanitario de Burriana, Burriana, Castellón, Spain
[c] Subdirección General de Farmacia y Productos Sanitarios, Madrid, Spain
[d] Servicio de Farmacia, Hospital Universitario Infanta Leonor, Madrid, Spain
[e] Servicio de Farmacia, Hospital Universitario Severo Ochoa, Leganés, Madrid, Spain

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ABSTRACT

Objective: Develop an App to use in healthcare practice, with updated and accurate information on the handling of medications in patients with dysphagia or deglution disorders, as well as their compatibility with food and thickeners.
Methods: The development of the Deglufarm?up]® App was based on the CRONOS, Nutrition and Techno working groups of the Sociedad Española de Farmacia Hospitalaria. A group of specialist pharmacists was created from different care areas for patients with dysphagia. The creation of Deglufarm® consisted of several stages: selection of active drugs, literature review, content development, design (an expert company in App design was contacted), testing, launch, content update and follow-up.
Results: Deglufarm® is available for Android and IOS free of charge from July 2022. It has been tested among the members of the research group and collaborators, Currently, 540 monographs of active drugs have been reviewed and registered in Deglufarm. The first version is aimed at healthcare professionals.
Conclusions: Deglufarm® is an easy tool to consult, with the most current evidence on handling the medicines it contains.

Deglufarm: Aplicación móvil con recomendaciones para la administración Segura de medicamentos en pacientes con disfagia o problemas de deglución

Palabras clave:
Aplicación móvil
Administración de fármacos
Disfagia
Deglución

RESUMEN

Objetivo: Desarrollar una App para su uso en la práctica asistencial, con información actualizada y veraz sobre la manipulación de medicamentos en pacientes con disfagia y otros problemas de deglución, así como su compatibilidad con alimentos y espesantes.
Método: El desarrollo de la App Deglufarm® se hizo con un proyecto de los grupos de trabajo CRONOS, Nutrición y Tecno de la Sociedad Española de Farmacia Hospitalaria. Se constituyó un grupo de farmacéuticos especialistas, de diferentes ámbitos de la atención al paciente con disfagia. La creación de Deglufarm® constó de varias etapas: selección de principios activos, revisión bibliográfica, elaboración de contenidos, diseño (se contactó con una empresa experta en diseño de Apps), testing, lanzamiento, actualización de contenidos y seguimiento.
Resultados: Deglufarm® está disponible para Android e IOS gratuitamente desde julio-2022. Ha sido testada entre los miembros del grupo investigador y colaboradores. En la actualidad se han revisado y registrado en Deglufarm® 540 monografías de principios activos. La primera versión está dirigida a profesionales sanitarios.

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* Corresponding author.
E-mail address: eva.delgado@salud.madrid.org (E. Delgado-Silveira).

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Conclusiones: Deglufarm® es una herramienta fácil y sencilla de consultar, con la evidencia más actual sobre la manipulación de los medicamentos que contiene.

Introduction

Dysphagia is a health condition defined as difficulty in forming and/or moving the food bolus safely and efficiently from the mouth to the esophagus[1]. It is estimated to affect 8% of the population[2]. Oropharyngeal dysphagia occurs in patients with neurodegenerative, neurological, and oncological diseases and is now considered a geriatric syndrome[3]; one in five elderly people have swallowing problems and, consequently, difficulties in taking medication[4]. Dysphagia causes multiple complications that have a great impact on the patients' health, nutritional status, functionality, morbidity, and quality of life[3].

Difficulty in swallowing medications is an issue for many such patients regarding their daily drug intake, which can lead to adherence problems, adverse effects, and loss of efficacy of drug treatment.

These challenges have driven the need to improve the textures of drugs making them easier and safer to digest; however, when there is no alternative, these difficulties have also led to the manipulation of the pharmaceutical forms (by crushing, fragmentation, or emptying capsules), which can sometimes be inadequate, thus affecting pharmacokinetics, therapeutic efficacy, or safety[5,6]. In the case of liquid dysphagia, these drugs may have to be handled and combined with food or thickeners.

Therefore, healthcare professionals need to have up-to-date, evidence-based information on drug manipulation and have to know which drugs can be administered with food or thickeners to ensure correct drug administration. Recent years have seen the publication of guidelines and articles on this topic[5–8]; however, to date, this information has not been made collectively available in mobile application (app) format. Several publications have suggested that the use of apps in the healthcare setting can be effective in improving patient care and increasing access to the information needed by healthcare professionals in their daily work[9].

Our objective was to develop a healthcare app using updated accurate information on drug manipulation in patients with dysphagia and other swallowing problems and on their compatibility with food and thickeners.

Methods

The Deglufarm project was initiated in January 2019 by the CRONOS group of the Spanish Society of Hospital Pharmacy (SEFH) in collaboration with the Nutrition and Techno groups.

A working group (Research Group [RG]) of specialist pharmacists from different healthcare settings was formed, some of whom were coordinating members of the SEFH working groups behind the project. Several meetings were held regarding organization, the distribution of tasks, and responsibilities.

Stages:

- Selection of active ingredients: the RG met several times and, via consensus, prioritized the drugs commonly used in chronic patients. The Drug Information Centre (CIMA) database of the Spanish Agency of Medicines and Medical Devices (AEMPS) was used to classify the drugs by Anatomical Therapeutic Chemical Classification System (ATC) group.
- Literature review: using different search strategies and MeSH terms related to dysphagia (Annex 1), the available evidence was reviewed in The Cochrane Library, Centre for Reviews and Dissemination, PREMEDLINE, MEDLINE, and EMBASE; we also searched guidelines, manuals, and original articles. No limit was placed on the time of publication, although priority was given to publications less than 10 years old in the English or Spanish languages.

The most relevant bibliographic references were chosen from the selected articles and the gray literature, especially those from scientific societies, collaborative groups, and other entities related to evidence-based medicine and chronic patient care. In addition, when no information was found, the marketing laboratory was contacted.

Zotero reference management software was used to manage the documentation.

- Content development: 42 pharmacists collaborated in the project by reviewing, extracting, and structuring the information. Peer review was conducted. The RG reviewed the information prepared by the collaborators and adapted it to the app format. Data collection was conducted using REDCap[10] and then Microsoft Access.
- Development: design and development were conducted by Primate, which is a company with experience in the creation of apps. The RG selected and validated the most appropriate design from among several prototypes.
- Testing: the content was delivered to the company, which provided an initial beta version. This version was reviewed and tested by the RG and errors were corrected. In addition, a usability test was conducted by the RG and collaborators, who checked its ease-of-use and handling.
- Launching on platforms.
- Monitoring and updating content: new active ingredients will be added on an annual basis.

Results

In July 2022, Deglufarm was launched on Android and IOS mobile devices. The app is currently available on the App Store and Google Play, free of charge, and accessible to any user without registration.

Deglufarm presents an initial screen with information on general recommendations, links to web resources of interest on dysphagia, and access to a search engine by active ingredient and/or trade name of the content of the active ingredient sheets.

The active ingredient sheets comprise the following sections[11]: active ingredient, therapeutic group and subgroup (ATC classification), specific recommendations on hazardous drugs, oral dosage forms, correct drug manipulation, specific recommendations, compatibility and route of administration with thickeners, food, and oral nutritional support, master formulas, marketed pharmaceutical specialties and their excipients of mandatory declaration (EMO), general observations, literature, and date of revision.

A first version of the app was obtained after it was tested by the RG and collaborators. The final design included icons to simplify the main information. If users want more detailed information on a specific aspect, they can select pop-up windows which will display this information. Fig. 1 shows an example of an active ingredient dataset.

To date, 540 active ingredient datasets have been reviewed and recorded in the app (Table 1). The information contained in this first version is aimed at healthcare professionals.

Discussion

Pharmacists are often consulted regarding drug administration in patients with swallowing problems, because the Summary of Product Characteristics does not always address the issue of manipulation.

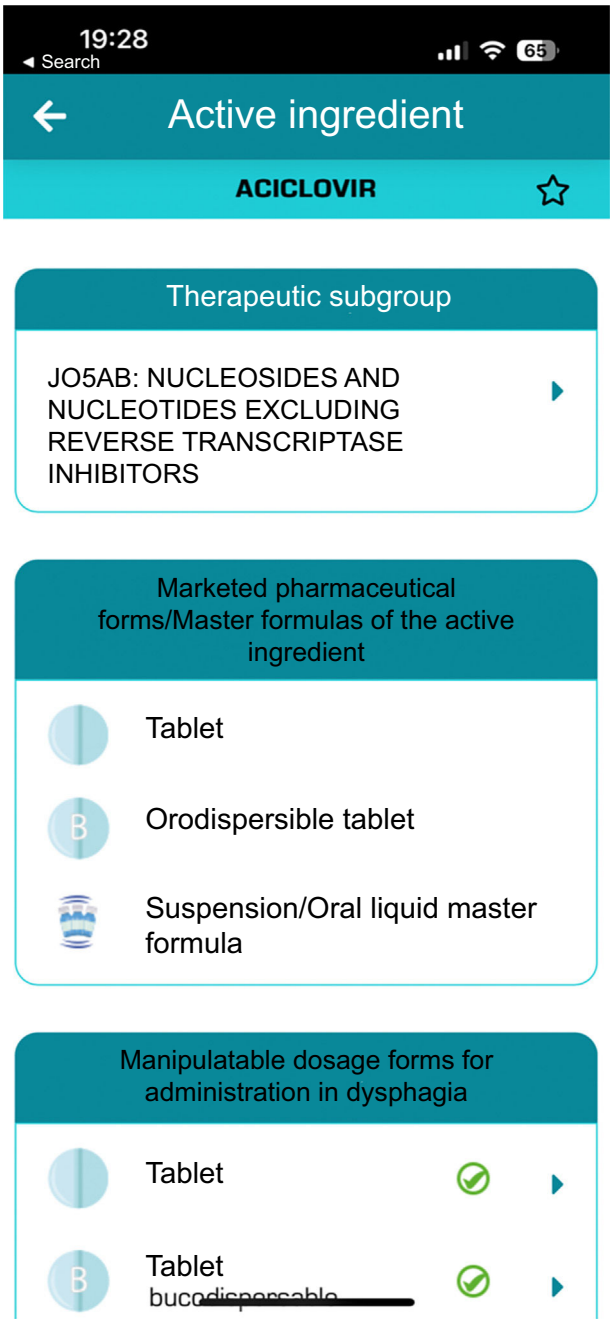

Fig. 1. Example of an active ingredient dataset.

Furthermore, although guidelines have been published on drug trituration and adaptation for their administration[12], most of them focus on enteral tube administration. These guidelines have served as a reference for drug administration in patients with dysphagia, since they provide information on trituration and compatibility with enteral nutrition; however, these guidelines do not always address the issue of oral administration in such patients.

The guidelines drawn up by Morera et al.[6] contain specific recommendations on drug administration in patients with dysphagia, but they do not provide in-depth information on compatibility with thickeners, the availability of alternative master formulas, or the EMOs of the marketed pharmaceutical specialties. Another recently published guideline[13] uses classification by active ingredient and provides specific information on compatibility with food and thickeners; however, it does not address compatibility with oral nutritional support, specify whether the drug is hazardous, or provide details on the availability of

Table 1
Results.

Active ingredients reviewed	540 active ingredients
Distribution by therapeutic group	82 active ingredients from group A 24 active ingredients from group B 138 active ingredients from group C 1 active ingredient from group D 24 active ingredients from group G 12 active ingredients from group H 42 active ingredients from group J 25 active ingredients from group L 22 active ingredients from group M 132 active ingredients from group N 6 active ingredients from group P 20 active ingredients from group R 1 active ingredient from group S 11 active ingredients from group V
Hazard category	57 hazardous active ingredients 483 nonhazardous active ingredients
Dosage forms that can be manipulated	797 dosage forms
Dosage forms that cannot be manipulated	161 dosage forms
Liquid master formulas	156 described master formulas
Compatibility with thickeners	36 incompatible active ingredients 134 compatible active ingredients 370 active ingredients, compatibility unknown
Compatibility with food	77 incompatible active ingredients 457 compatible active ingredients 6 active ingredients, compatibility unknown
Compatibility with oral nutritional support	136 incompatible active ingredients 339 compatible active ingredients 65 active ingredients, compatibility unknown

alternative master formulas or the EMOs of the marketed pharmaceutical specialties. Neither of the aforementioned guidelines differentiate between drugs regarding adaptations to the different types of dysphagia (liquids, solids, or mixed).

We have not found a specific app that provides recommendations for drug administration in patients with dysphagia in Spain. Thus, Deglufarm is a novel tool that includes all the evidence reviewed in a homogeneous, visual, accessible, and interactive way, and which has been tested before obtaining the definitive version. We believe that the need for such an app is vital at the present time, in which technology and digital skills are increasingly prevalent, and where electronic devices are important sources of information in decision making that can be carried by healthcare professionals at all times.

It would be very useful in clinical practice to be able to integrate the information from the app in electronic prescribing software such that the information would be available when reporting that the patient has a swallowing problem.

One of the limitations of the project is that there is little evidence on the compatibility of drugs and thickeners. Some studies have addressed this issue[5,7,8] and the app contains this information; nevertheless, we believe further research is needed to generate more information on this topic. There is also an absence of data on the manipulation of specific pharmaceutical forms due to the lack of manufacturing laboratory studies; thus, we find ourselves in a quandary regarding whether a given manipulation is adequate from the point of view of drug safety and stability.

One of the strengths of Deglufarm is that the contents are updated via the incorporation of new active ingredients. Work is underway to incorporate the recently revised group of oral antineoplastic agents[14,15]. Although Deglufarm is designed for healthcare professionals, future versions are expected to focus on patients and caregivers.

We believe that Deglufarm is a simple, easy-to-use tool, which includes all the current evidence on drug manipulation in patients with dysphagia and other swallowing disorders.

Contribution to the scientific literature

Deglufarm is an application for mobile devices that helps healthcare professionals to make decisions on the administration of medicines to patients with swallowing and dysphagia problems. It contains all the most relevant information regarding medication handling and possible alternatives.

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Delgado Silveira, E; Hidalgo Correas, FJ; Ávaro Alonso, EA; Beobide Tellería, I Bravo José, P; Casajús Lagranja, MP; Llanos García, MT; Saavedra Quirós, V. Development of a mobile application for medication administration in patients with dysphagia. Operational Communication in poster format. 67th National Congress of the Spanish Society of Hospital Pharmacy, celebrated in Barcelona from 24 to 26 November 2022.

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Conflict of interest

The authors declare that they have no conflicts of interest.

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Appendix A. Literature search

1. Drug administration in patients with dysphagia.

Disfagia OR "desórdenes de deglución" OR "alteraciones deglución" OR "dificultades deglución".

Dysphagia OR "Deglutition disorders" OR "swallowing problems" OR "Swallowing difficulties".

AND

"Administración de medicamentos" OR "administración de fármacos" OR "fármacos machacados".

"Medicine administration" OR "drug administration" OR "crushing drugs".

2. Nasogastric tube drug administration.

"Sonda nasogástrica".

"Feeding tube".

AND

"Administración de medicamentos" OR "administración de fármacos" OR "preparaciones farmacéuticas" OR "fármacos machacados".

"Drug administration" OR "Medicine administration" OR "Pharmaceutical Preparations" OR "crushing drugs".

3. Compatibility of drugs with thickeners, food, and enteral nutrition formulas.

"Compatibilidad medicamentos" OR "compatibilidad fármacos" OR "interacción de fármacos".

"Drug compatibility" OR "drug stability" OR "drug interactions".

AND

"Espesante" OR "comida" OR "nutrición enteral".

"Thickened fluids" OR "Enteral Nutrition" OR "food".

4. Drugs that cause dysphagia.

"Medicamentos que causan disfagia".

"Drug-induced dysphagia" OR "Medication-induced dysphagia".

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