

Intestinal failure functional classification type associated with an extended length of stay at the intestinal failure unit, Central Hospital in Chihuahua, Mexico

Asociación entre el tipo de falla intestinal según la clasificación funcional y la estancia hospitalaria prolongada en la unidad de falla intestinal del Hospital Central del Estado, en Chihuahua, México

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Abstract

Background: Intestinal failure (IF) was first defined as “a reduction in the functioning gut mass below the minimal amount necessary for adequate digestion and absorption.” In our environment, there are no statistical data for IF in adult patients’ extended length of stay (LOS), nor the economic impact that it implies. **Objective:** The objective of the study was to describe the association between the IF type and extended LOS. **Methods:** Patients admitted to our IF Unit between March 2016 and March 2018 were enrolled. We conducted a 2-year retrospective cross-sectional study. **Results:** From the total of 53 patients, 35% corresponded to type I IF, 58.5% to type II IF, and 7.5% to type III IF. The mean LOS, according to the type of functional IF was 51 days for type I, 77.48 days for type II, and 68.25 days for type III. The mean LOS for the three IF types was 67.79 days. **Conclusion:** Extended LOS occurs in an important proportion of patients with IF, resulting in increased morbidity and mortality, as well as in costs and associated side effects. Future research should focus on economic studies, to know the economic impact that this subject entails for our health systems.

KEY WORDS: Intestinal failure. Post-operative complications. Extended length of stay. Abdominal surgery.

Resumen

Antecedentes: En nuestro entorno no existen datos estadísticos sobre la falla intestinal en adultos, su estancia hospitalaria prolongada (EHP) ni el impacto económico que implica. **Objetivo:** Describir la asociación entre el tipo de falla intestinal y la estancia hospitalaria prolongada en pacientes de la unidad de falla intestinal del Hospital Central del Estado Chihuahua, México. **Método:** Se realizó un estudio transversal retrospectivo con un total de 53 participantes durante el periodo de marzo de 2016 a marzo de 2018. **Resultados:** De los 53 pacientes, el 35% tuvieron falla intestinal tipo I, el 58.5% tipo II y el 7.5% tipo III. La media de estancia fue de 51 días para la falla intestinal tipo I, 77,48 días para la tipo II y 68,25 días para la tipo III. La media de estancia hospitalaria para los tres tipos de insuficiencia intestinal fue de 67,79 días. **Conclusiones:** La estancia hospitalaria prolongada ocurre en una proporción importante de pacientes con falla intestinal, lo que resulta en un

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aumento de la morbilidad, la mortalidad y los costos. Investigaciones futuras deberían centrarse en la realización de estudios económicos para conocer el impacto que esta cuestión tiene para nuestros sistemas de salud.

PALABRAS CLAVE: Falla intestinal. Complicación posquirúrgica. Estancia hospitalaria prolongada. Cirugía abdominal.

Introduction

The term “intestinal failure” (IF) was first defined in 1981 by Fleming and Remington as “a reduction in the functioning gut mass below the minimal amount necessary for adequate digestion and absorption of food¹.” On the basis of different onset, metabolic, and expected outcome criteria, IF is classified as Type I, Type II, and Type III². No scientific society has yet devised a formal classification; thus, several other classifications exist, indicating a lack of organization from the scientific community regarding the subject. Some of which are promptly addressing the problem, trying to structure, and standardize the diagnosis of IF, which would provide clinicians with the basis to better communicate with each other within the scientific community, being able to better study the treatment impact and indications, as well as optimize resources usage³.

IF entails difficulties in maintaining water, electrolyte, and micronutrient balance, which implies complex management and demands the work of a multidisciplinary team. Patients require an extended length of stay (LOS), resulting in an increased morbidity and mortality, as well as an increase in costs and all the associated side effects. Thereby, recognition of the main onset of diseases and their effective intervention is a priority in current medicine^{4,5}.

Epidemiology

Some centers have reported the prevalence of IF on 11.62-18 cases per million population^{6,7}. The incidence distribution has been reported as 74.1% for Type I IF, 24.1% for Type II, and 1.9% for type III⁸, as well as an average LOS of 44 days for all patients with IF⁹.

In our environment there's no statistical data for IF in adults, much less regarding patients' LOS, and its economic impact. Therefore, the importance of carrying out studies of this nature to has reliable data available to clinicians that they could use as a reference when dealing with these types of pathologies.

IF: diagnosis and management

There are several classifications and definitions regarding IF, within the most accepted classifications there are a “functional classification of IF,” a “pathophysiological classification of IF,” and a “clinical classification of chronic IF.”

FUNCTIONAL CLASSIFICATION

- Type I: acute, short-term and usually self-limiting condition
- Type II: prolonged acute condition, often in metabolically unstable patients, requiring complex multi-disciplinary care, and intravenous supplementation over periods of weeks or months
- Type III: chronic condition, in metabolically stable patients, requiring intravenous supplementation².

PATHOPHYSIOLOGICAL CLASSIFICATION

This classification underlines the main mechanisms that, alone or in the association, can determine the development of an IF. It consists of five major pathophysiological conditions, which may originate from various gastrointestinal or systemic diseases:

- Short bowel
- Intestinal fistula
- Intestinal dysmotility
- Mechanical obstruction
- Extensive small bowel mucosal disease¹⁰.

CLINICAL CLASSIFICATION

This is the most recent classification since the experts' panel of the European Society for Clinical Nutrition and Metabolism agreed on the need for a “clinical classification” of IF, aiming to facilitate communication and cooperation among health professionals. Considering that no published data were available to be used as a starting point, the development of a “clinical classification” was based on the common experience of the panel of experts, and they reached the consensus of classifying it as benign

disease or active cancer, it is also based on the intravenous “energy and volume” requirements. As it would be expected, this classification contains a wide range of patient distribution and in the variability of pathophysiological causes as well as in the energy requirements¹¹.

To be effective, IF management requires a multidisciplinary team setting involving intensivists, internists, gastroenterologists, nutritionists, psychologists, psychiatrists, rehabilitation personnel, specialized nursing staff, surgeons, radiologists, nephrologists, respiratory therapists, infectologists and transplantologists, experts in stoma/wound management, anesthesiologists, and others according to specific organ dysfunctions. Sepsis control is important in the management of the acute phase on IF, as well as loss of volume control, specific antibiotic therapy, wound and stoma management, intensive management of hydroelectrolytic imbalance, total parenteral nutrition, multiple derivative surgical procedures, collections drainage and debridement, and the culmination on intestinal transplantation in some cases¹²⁻¹⁵.

Prolonged length of hospital stay

Prolonged length of hospital stay or LOS was defined as a LOS $\geq$ the 75th percentile for all procedures¹⁶, the main cause of IF in the adult population is due to abdominal surgical procedures complications, therefore, any IF is considered a prolongation of the primary procedure.

Extended LOS can be considered as an indicator of lack of efficiency in the patient's flow. In addition, the direct relationship between extended LOS and the hospital beds availability can also increase the costs of care, the risk of associated side effects events and mortality¹⁷.

This problem does not only affect health institutions but also has important repercussions on insurers and patients; since it limits the capacity of hospitals, making it difficult for patients to access a hospital bed, increases operating costs due to inappropriate use of resources and affects the quality of care in terms of patient safety¹⁸.

In a retrospective study on the economic burden of postoperative ileus conducted in the United States, Iyer et al. identified 17,876 patients with primary procedure code for colectomy, of which, 3115 (17.4%) of the patients were classified with the presence of post-operative ileus (POI) (corresponding to a

dysmotility-type IF). They found that the mean and standard deviation (SD) hospital LOS was significantly longer in patients with POI (13.8 [SD: 13.3] days) compared with patients without POI (8.9 [SD: 9.5] days), which also corresponded to a mean cost of hospitalization of \$ 25,089 USD and \$ 16,907 USD respectively¹⁹.

In patients undergoing colorectal surgery, it was found that up to 38% of patients had an extended LOS, increasing mortality and adverse events such as cardiac arrest, septic shock, myocardial infarction, and renal failure with a high probability of death after 30 days of surgery²⁰. Even in patients not submitted to surgical procedures but with IF, extended LOS leads to an increase in infections and a 13.6% mortality²¹.

A condition not as severe, as POI produces a significant increase in the LOS days, in addition these patients are more prone to post-operative complications, re-interventions, readmissions, and mortality compared to those in which early bowel function was regained²². Asgeirsson et al. found that in patients suffering from POI, the total cost was significantly higher (\$ 16,600 USD vs. \$ 8,300 USD, $p < 0.05$), this increase correlated to 4 versus 8 days²³.

Materials and methods

This was a 2-year retrospective cross-sectional study conducted at the IF Unit, Central Hospital in Chihuahua, Mexico. On hospital's ethics committee approval, we analyzed the IF Unit, finding a total of 53 patients, admitted to IFU between March 2016 and March 2018, which met the inclusion criteria to be enrolled in the present study. Data capturing were made using Microsoft® Excel spreadsheet; SPSS® (IBM™ Statistical Package for the Social Sciences version 22.0) software (SPSS, Chicago, IL, USA) was used for multivariate statistical analyses using Student's t-test.

Results

A total of 53 patients admitted to the IFU from its opening (March 2016) to date (March 2018) were enrolled in this study. The following data were collected for analysis: diagnosis at IFU, IF type, and hospital inpatient LOS.

From the total of 53 patients included in the study, all met the inclusion criteria. As for the IF type found in our population, 35% (18/53) of patients

Table 1. Report

Functional type	Length of Stay (days)		
	Mean	N	Standard deviation (SE)
I	51.00	18	25.514
II	77.48	31	88.576
III	68.25	4	59.952
Total	67.79	53	71.416

corresponded to Type I IF, 58.5% (31/53) to Type II IF (being the most prevalent type of IF, constituting more than half of the cases), and 7.5% (4/53) corresponded to Type III IF. In regard to the pathophysiological classification in our unit, 28 patients (52.8%) corresponded to intestinal fistula, 14 patients (26.4%) to dysmotility, 7 (13.2%) to intestinal obstruction, 3 (5.7%) to malabsorptive syndromes, and only 1 (2.8%) to short bowel syndrome.

The mean LOS according to the type of functional IF was 51 ± 25.51 days for Type 1 IF, 77.48 ± 88.57 days for Type 2 IF, and 68.25 ± 59.95 for Type 3 IF (Table 1). The mean ($\pm$ SE) LOS for the three IF types was 67.79 ± 71.41 days (range 10-413 days).

According to the pathophysiological classification, in our IFU we found that patients with intestinal fistula had a mean LOF of 83.3 days (range 13-413), in comparison with 2009 data from Instituto Nacional de Ciencias Medicas y Nutrición Salvador Zubirán, Mexico City, where a mean LOS of 30 days was found²⁴. For patients with intestinal dysmotility, we found a mean LOF of 48.5 days (range 13-117) as compared with data observed by the University of Wisconsin, United States, on patients with POI with a mean LOF of 8 days; we assumed that so much difference in the results is due to the fact that they are patients with no added pathology more than the surgery itself, while in our case they are patients with IF and malnutrition. For patients with intestinal obstruction, a mean LOS of 62.1 days (range 35-85) was observed and 26 days (range 10-36) for patients with the malabsorptive disease.

Discussion

One of the main challenges at our IF Unit was training hospital staff in the management of these patients, who were not familiar with the multidisciplinary approach of the patient with IF, and patient management standardization. Which led, in the beginning, to the

evolution of these patients not being as expected and with extended LOS; however as teams became more familiar with IF patient management, a decrease in patients' LOS was observed.

It is important to carry out this type of epidemiologic studies to properly identify the causes that lead to extended LOF because its decrease has a direct impact on both patients' morbidity and mortality as well as in potential economic costs reduction for our public health systems. We hope that as a medical society in our environment becomes more familiar with the required multidisciplinary management of these patients, they will become aware of its importance and refer the patients from the different institutions to our unit and in that way, increase our experience and casuistry. It would be ideal for additional economic studies to be carried out, to know the economic impact that this subject entails for our health systems.

Declaration of interests

We declare no competing interests.

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Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

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