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PEDAGOGICAL ARTICLE

Invariant procedural skills for diagnosis and treatment of postoperative peritonitis

Habilidades procedimentales invariantes para el diagnóstico y el tratamiento de la peritonitis posoperatoria

Habilidades processuais invariantes para o diagnóstico e tratamento da peritonitepós-operatória

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ABSTRACT

Introduction: invariant procedural skills in postoperative peritonitis allow surgeons an early diagnosis and the performance of urgent abdominal resurgery. **Objective:** to design invariant procedural skills to be implemented for surgeons on the diagnostic and therapeutic care of postoperative peritonitis. **Method:** a qualitative research was conducted at the Hospital Clínico Quirúrgico "Ambrosio Grillo" of Santiago de Cuba in the quarter period of May-July 2022. The study population consisted of 33 specialists on postoperative peritonitis: 22 physicians (12 surgeons and 10 intensivists) and 11 graduated bachelor in nursing. Systematization was used as the theoretical method and the empirical methods used were the document analysis supported with the review of clinical histories and the observation with the main author's attentional-teaching practice. **Results:** it was designed an invariant procedural skills for the early diagnosis and therapy of postoperative peritonitis with special emphasis on the clinical method. The self-preparation on the subject makes possible the complementation of both knowledge and skills learned, as well as an update of knowledge that guarantees the surgical clinical care of these complex patients. **Conclusions:** the design of invariant procedural skills for the early diagnosis and therapy of postoperative peritonitis in the necessary permanent and continuous knowledge improvement of surgeons represents a care-teaching tool that contributes to improve the professional performance at the time to attend to this type of patient.

Keywords: invariant procedural skills; clinical method; on the workplace teaching environment; postoperative peritonitis; learning tool

RESUMEN

Introducción: las habilidades procedimentales invariantes en las peritonitis posoperatorias, les permite a los cirujanos el diagnóstico temprano y la reoperación abdominal urgente. **Objetivo:** diseñar las habilidades procedimentales invariantes de atención diagnóstica y terapéutica a la peritonitis posoperatoria dirigida a los cirujanos. **Método:** se realizó una investigación cualitativa en el Hospital Clínico Quirúrgico "Ambrosio Grillo" de Santiago de Cuba en el trimestre mayo-julio de 2022. La población de estudio estuvo constituida por 33 profesionales tratantes de la peritonitis posoperatoria: 22 médicos (12 cirujanos y 10 intensivistas) y 11 licenciadas en Enfermería. Se utilizó la sistematización como método teórico y como método empírico la revisión documental con la revisión de las historias clínicas y la observación con la práctica atencional-docente de la autora principal. **Resultados:** se diseñaron las habilidades procedimentales invariantes para el diagnóstico temprano y la terapéutica de la peritonitis posoperatoria dirigida a los cirujanos con especial importancia en el método clínico. La autopreparación del tema en cuestión posibilita la complementación de conocimientos y habilidades aprendidas, así como la actualización de saberes que garantiza la atención clínica quirúrgica a este complejo enfermo. **Conclusiones:** el diseño de las habilidades procedimentales invariantes para el diagnóstico temprano y la terapéutica de la peritonitis posoperatoria en la necesaria superación permanente y continuada de los cirujanos representa una herramienta asistencial-docente que contribuye al mejoramiento del desempeño profesional ante este tipo de enfermo.

Palabras clave: habilidades procedimentales invariantes; método clínico; educación en el trabajo; peritonitis posoperatoria; herramienta de aprendizaje

RESUMO

Introdução: as habilidades processuais invariantes naperitonitepós-operatóriapermitemaoscirurgiões o diagnóstico precoce e a reoperação abdominal urgente. **Objetivo:**projetar as habilidades processuais invariantes de atenção diagnóstica e terapêutica para peritonitepós-operatória destinadas a cirurgiões. **Método:**uma pesquisa qualitativafoi realizada no Hospital Clínico Cirúrgico "Ambrosio Grillo" em Santiago de Cuba no trimestre maio-julho de 2022. A população do estudoconsistiu em 33 profissionais que tratam de peritonitepós-operatória: 22 médicos (12 cirurgiões e 10 intensivistas) e 11 graduados em enfermagem. Utilizou-se como método teórico a sistematização e como métodos empíricos a revição documental comrevisão de histórias clínicas e a observaçãocom a prática docente-atencional da autora principal. **Resultados:**desenharam-se competênciasprocessuais invariantes para o diagnóstico precoce e terapêutica da peritonitepós-operatória dirigidas a cirurgiõescom especial importância no método clínico. O autopreparo do sujeito em questãopossibilita a complementação dos conhecimentos e habilidades aprendidas, bem como a atualização de conhecimentos que garantem o cuidado clínico cirúrgicodesta complexa doença. **Conclusões:** o desenho de habilidades processuais invariantes para o diagnóstico precoce e tratamento da peritonitepós-operatória no necessárioaperfeiçoamento permanente e contínuo dos cirurgiões representa umaferramenta cuidado-ensino que contribui para o aperfeiçoamento da atuaçãoprofissionalfrente a este tipo de paciente.

Palavras-chave: habilidades processuais invariantes; método clínico; educação no trabalho; peritonitepós-operatória; ferramenta de aprendizado

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INTRODUCTION

The permanent and continuous improvement of surgeons contributes to the improvement of professional performance for the solution of a social health problem identified as postoperative peritonitis.[1,2,3] This intra-abdominal infection is a serious complication of abdominal surgery that shows mortality figures between 8% - 60%. It requires urgent abdominal reintervention to solve it and in many occasions the application of the open abdominal technique, which complicates the surgical clinical care.[4,5]

Hence, early diagnosis becomes a requirement, and from an service improvement approach, actions are planned for the development of skills in the clinical method as an irreplaceable diagnostic procedure;[6,7] the validity of this method applied at the bedside of the patient confirms the accurate and timely detection of the complication without waiting for the results of complementary tests, the specific therapeutics and fast recovery of the affected person.[8,9]

Accordingly, surgeons' self-preparation is a form of self-improvement[10,11] that enables them to complement the specific knowledge and skills learned during the residency period, as well as the systematic updating of knowledge for an optimal performance in this complex disease.

Taking into account the previous ideas, the development of specific professional skills in the care of a patient with an abdominal surgery whose evolution is not satisfactory is relevant. The integration of symptoms, signs and important surgical data in the clinical history allows an early clinical diagnosis that can be corroborated with specific laboratory and imaging tests. On the other hand, the empowerment of knowledge for the fulfillment of specific therapeutic principles contributes to an optimal performance in this area of surgical knowledge.

In this sense, this research is carried out with the aim of designing the procedural invariants of diagnostic and therapeutic skills in postoperative peritonitis directed to surgeons.

METHOD

A qualitative research was carried out at the Hospital Clínico Quirúrgico “Ambrosio Grillo” in Santiago de Cuba in the May-July 2022 quarter; whose object of study was the design of procedural invariants of diagnostic and therapeutic skills in postoperative peritonitis.

The study population consisted of 33 professionals treating surgical complications: 22 physicians (12 surgeons and 10 intensivists) and 11 nurses from the intensive care unit.

Systematization was used as a theoretical method; basic and updated relevant bibliography on the subject for the last six years was consulted, in Spanish and English, with the use of the descriptors: clinical method and postoperative peritonitis.

Three empirical methods were used: the document analysis, that allowed the verification in the clinical histories of the main difficulties for an early diagnosis of the complication, the scientific observation of the main author to the performance of the surgeons in the different scenarios in the treatment of this type of patient and the initial and final performance test applied to the surgeons by means of a theoretical knowledge test before and after the implementation of the improvement strategy (Complementary files at the end).

RESULTS

Particularly on the subject of the clinical method, the invariants of the procedural skills for the early diagnosis of postoperative peritonitis and the therapeutic resolution are listed below (Chart 1). Therefore, they constitute specific skills of necessary incorporation to the daily surgical practice for an optimal professional performance.

Chart 1. Invariant procedural skills addressed to surgeons when faced with a patient intervened on the abdomen who evolves unsatisfactorily.

Components of the clinical method. Formulation of the problem (Unsatisfactory evolution of a patient with abdominal intervention).	
Information(Sensory phase)	**Professional skills** (invariant procedural skills)
I. Interrogation of the patient who has undergone abdominal surgery	✓ Assertive communication and humane treatment of the patient. ✓ Application of the ALICIA FREDUSA resource for abdominal pain. ✓ Determination of accompanying symptoms: hiccups, vomiting (amount and characteristics), diarrhea (amount and characteristics), rectal tenesmus, fever.
II. Exhaustive physical examination of the patient who has undergone abdominal surgery.	✓ Perform a general physical examination with emphasis on general condition, face, mucous membranes, hydration status, vital signs, gait and bed position. Presence of alarm signs: peritonitis facial signs, elements of Systemic Inflammatory Response Syndrome (SIRS): tachycardia >90 beats/min, tachypnea >20 breaths/minute, need for mechanical ventilation, fever >38oC or hypothermia <36oC, altered mental status, oliguria, delayed capillary refill, severe dehydration despite adequate fluid therapy. ✓ Perform abdominal physical examination: presence of abdominal distention, symmetry or asymmetry of the distention, the state of the surgical wound (whether or not it has signs of infection or necrosis, fetidness, outflow of abnormal fluid contents), the functional state of the abdominal drainage(s), the viability and function of a stoma. Palpation: presence of localized or generalized abdominal pain, localized or generalized abdominal contracture, presence of tumor and its characteristics (location, size, number, tenderness, borders, mobility or fixation, whether it is pulsatile or not, whether it is located in the abdominal wall or intracavitary). Percussion: presence of localized or generalized percussive pain. Auscultation: presence of total silence, normal or diminished hydroaerial sounds. ✓ Perform digital rectal examination and/or vaginal examination if necessary. ✓ Perform abdominal and/or Douglas pouch curettage, peritoneal lavage and intra-abdominal pressure measurement if necessary. Presence of alarm signs: spontaneous localized or generalized abdominal pain, on

	palpation and percussion, localized or generalized peritoneal reaction, symmetrical abdominal distension, total auscultatory silence, drainage(s) with discharge of seropurulent fluid, purulent or fecaloid, food, intestinal contents, bile, putrid, ecchymotic or necrotic wound, partial or total dehiscence with or without evisceration, abnormal fluid discharge between stitches, elevated intra-abdominal pressure (>20 mmHg).
Rational phase (Clinical reasoning)	**Findings of surgical data of interest with the evaluation of the medical history.**
	✓ Review of clinical history: age, associated comorbidities, immunonutritional status. ✓ Review of clinical history (anesthesia protocol and surgical report): ASA preoperative anesthesiological classification, preoperative and operative diagnosis, organ affected, etiology of the condition (congenital or acquired, traumatic or spontaneous, inflammatory, neoplastic or vascular), type of surgery (urgent or elective, clean, clean contaminated, contaminated or dirty, whether exeretic or derivative or exeretic and derivative or only derivative), whether it was performed by resident or specialist, days of performed, time elapsed between the onset of the condition-the diagnosis-the operation, time elapsed between the initial surgery and the patient's current clinical situation, whether it is the first, second or third reoperation, whether there were accidents, the anesthetic-surgical time used in the procedure, antimicrobials used, hydration scheme applied, type of parietal abdominal closure, whether the postoperative period elapsed in surgery or therapy room. Important findings: poor immunonutritional status, prolonged anesthetic-surgical time, operation performed as an emergency, complicated digestive cancer or generalized peritonitis as initial diagnosis, small or large bowel operated on, intestinal suture performed, number of reoperations, the delay greater than 24 hours between diagnosis and initial operation, whether there was damage control surgery, the delay between the initial surgery and the first reintervention, the characteristics of the peritoneal fluid found, the ineffectiveness of the surgical technique used, the lack of intracavitary infection control with the first operation, and the number of reinterventions.

<table>
<tr><td>Hypothesis formulation</td><td>Presumptive diagnosis of postoperative peritonitis</td></tr>
<tr><td>Contrast

Practical phase</td><td>Performance of complementary tests.

1. Indication and interpretation of complementary studies:

(a) Analytical (biomarkers of infection):
- Complete blood count: decreased hemoglobin and hematocrit, leukocytosis with neutrophilia or neutropenia, presence of young cells in periphery (stabs).
- C-reactive protein: elevated (>15 mg/dl) from the third postoperative day.
- Serum lactate: elevated (>7.5mg/dl).
- Serum albumin: decreased (<2.8 mg/dl).
- Serum high density lipoproteins (serum HDL): decreased (<30mg/dl).
b) Imaging.
- Standing PA chest X-ray: image of pulmonary edema or pleural effusion.
- Plain abdominal radiograph in standing and lying positions: typical pattern of paralytic ileus, diffuse radiopaque image showing free fluid in the abdominal cavity and thickening of the intestinal wall.
- Abdominal ultrasound: encapsulated or diffuse intra-abdominal fluid collections or within a solid viscus.
- Others: simple and contrasted abdominopelvic CT, MRI.
c) Endoscopic.
Urgent decompressive endoscopic retrograde cholangiopancreatography (ERCP) with or without sphincterotomy in complicated acute pancreatitis of biliary origin.
d) Microbiological.
- Culture of pus from the abdominal cavity, surgical wound, drainage orifice, blood culture in the presence of fever, bilic culture, urine culture.

2. Application of the predictive indexes of intra-abdominal complication (to be registered in the medical record):
A. Mannheim score (if ≥30 points: Reintervention).

<table>
<tr><th>Risk factors</th><th>Score</th></tr>
<tr><td>Age >50 years</td><td>5</td></tr>
<tr><td>Female sex</td><td>5</td></tr>
<tr><td>BMD present</td><td>7</td></tr>
<tr><td>Cancer present</td><td>4</td></tr>
<tr><td>Preoperative >24h</td><td>4</td></tr>
<tr><td>Non-colonic source of infection</td><td>4</td></tr>
<tr><td>Generalized peritonitis</td><td>6</td></tr>
<tr><td>Type of exudate:</td><td></td></tr>
<tr><td>Clear</td><td>0</td></tr>
<tr><td>Purulent</td><td>6</td></tr>
<tr><td>Fecaloid</td><td>12</td></tr>
</table>
</td></tr>
</table>

Verification

B. Predictive index for abdominal reinterventions (ARPI) (≥15 points): Reintervention).

Parameters	Score
Urgent surgery	3
Respiratory failure	2
Renal failure	2
Paralytic ileus of more than 72 hours	4
Abdominal pain of more than 48 hours	5
Wound infection	8
Alterations of consciousness	2
Symptoms 3-4 days after surgery	6

3. Medical team discussion of the patient with clinical criteria of postoperative peritonitis:
- Findings of general and abdominal alarm symptoms and signs.
- Persistent dehydration despite correct fluid therapy.
- Frequent hiccups and diarrhea with rectal tenesmus.
- Persistent paralytic ileus more than 72 hours.
- Symmetrical abdominal distension with total auscultatory silence.
- Abdominal contracture and palpable tumor.
- Abdominal compartment syndrome present or impending (intra-abdominal pressure PIA > 20 mm/Hg).
- Parietal suture dehiscence with or without evisceration.
- Evidence of hollow viscus perforation.
- Outflow through the surgical wound or abdominal drainage of purulent, hemopurulent, browny-colored, blood, bile, jejunoileal or fecaloid intestinal contents, urine, food.
- Elevation of predictive indexes: Mannheim score ≥30 points.
- ARPI ≥ 15 points.
- Intensivists will additionally score APACHE II (Acute Physiology and Chronic Health Evaluation) + 15 points and SOFA (Acute Organ System Failure) + 6 points.
- Persistent clinical deterioration despite imposed therapeutics.

Corroboration of the presumptive diagnosis

Once the diagnosis has been verified:

- Making important annotations in the medical record: collective decision making on the therapy to be followed.
- Poor prognostic factors including advanced age, poor immunonutritional status, ASA anesthesiological classification IV and V physical status, associated comorbidities, the type of germ causing the peritoneal infection, the cause of peritonitis, the need for reoperation, the number of reoperations, the biomarkers of peritonitis, the altered infection biomarkers from the third postoperative day, the progressive installation of multiple organ dysfunction (MOD) and septic shock with need for mechanical ventilation and vasoactive drugs.
- Collective decision of abdominal reoperation (laparotomy reintervention) and the type of strategy to be used: on demand or programmed.

Informed Consent

a) If the patient is conscious, explain in clear and precise language the complication presented, the need for reoperation(s), the risk involved and the written authorization for the anesthetic-surgical procedure.
b) If the patient is not conscious or does not have autonomy, explain all of the above to the family member and the written authorization for the anesthetic-surgical procedure.

Treatment

- Prophylactic with the effectiveness of the first operation.
- Curative:

a) General medical procedure, including admission, vital signs checked every 3 hours, correction of the internal environment that achieves in the first 6 hours a CVP of 12 mm Hg and a diuresis of 0.5 ml/kg/hour associated with other measures such as blood transfusion, non-invasive mechanical ventilation and antipyretic medication.
b) Specific medical procedures, including broad spectrum antimicrobials and in combination, immunomodulators, anticoagulants, anti-ulcer drugs, parenteral or enteral nutrition, deep venous access and insertion of nasogastric and urethrovesical tubes.
c) Surgical, which includes elimination of the focus of infection by drainage, guided by abdominal ultrasound or through exploratory laparotomy, profuse peritoneal lavage of the peritoneal cavity with different tested solutions (physiological saline solution, saline solution with iodopovidone, hydrogen peroxide and magnetically treated saline solution) and drainage of the abdominal cavity with tubes inserted in different peritoneal spaces.
If postoperative peritonitis becomes persistent and difficult to control, requiring multiple reoperations, the application of the open abdomen technique for sequential washings is necessary, with notes in the medical records of the characteristics of the abdominal cavity according to Björck's classification after each peritoneal lavage.[12]

1a	Clean without adhesions.
1b	Contaminated without adhesions.
1c	Intestinal fluid, loops not fixed.
2a	Clean with fixed adhesions.
2b	Contaminated with fixed adherents
2c	Intestinal fluid, fixed loops.
3a	Clean frozen abdomen.
3b	Contaminated frozen abdomen.
4	Frozen abdomen and enteroatmospheric fistula.

- Detailed operative report without omissions.
- Postoperative follow-up in the intensive care unit with strict checking.

DISCUSSION

As stated by Álvarez de Zayas and referenced by Losada[8], skills are psychological structures of thought that allow knowledge to be assimilated, preserved, used and presented. They are formed and developed through the exercise of mental actions and become modes of action that provide solutions to theoretical and practical tasks. Clinical skills include diagnostic and therapeutic skills.

In Salas Perea's work[13] it is noted what Ilizástigui referred to about the clinical method skills in Cuban medical education. According to this author there are three phases and five stages. The three phases are: sensory, which obtains information about the patient's condition through interrogation and physical examination; rational, in which the intellectual skills of clinical reasoning predominate; and practical, which allows the interpretation of the results of complementary studies and therapeutic decisions.

These phases determine five stages:

- The problem: loss of health for which the patient asks for medical help.
- The search for basic information: referring to the patient's interrogation and physical examination.
- The elaboration of the clinical hypothesis: the formulation of one or more explanatory hypotheses of the problem based on the information gathered.
- The confirmation of the presumptive diagnosis: achieved through the study of the patient's evolution and the performance of complementary studies.
- Elaboration of the diagnosis of certainty: allows the initiation of specific therapy, the discovery of new problems or the negation of the hypotheses put forward.

Curbeira[14] maintains that the skills of the clinical method are considered specific to the profession, so they are also called professional skills and are the set of knowledge, competences and attitudes necessary for the correct performance of a given work activity in a profession, hence, they make possible the diagnosis and treatment of a disease. These skills also include the talent and aptitude of the health professional for the effective performance of a given task.

Therefore, the use of the clinical method in surgery in general and particularly in all on-the-job education settings for postoperative peritonitis care is of unquestionable value. Surgeons who disregard the scientificity of this method will be alien to clinical science and will be responsible for medical malpractice. It has been verified that the clinical method can provide up to 95% of the diagnosis.[15,16]

On the other hand, the medical record of the intervened patient is a wealth of information and, in a singular way; the well-known operative report provides details that are included in the percentage of information of the clinical method, to be taken into account in the daily clinical surgical practice.

It is worth highlighting the value of the clinical method in personalized medicine, a critical issue in medical care.[17,18] Every patient has its specifities, and for this reason the clinical and evolutionary expression is different for each patient, even when they have the same condition. Each patient is a new situation that must be researched and subjected to the diagnostic system to be used.

Currently, there is a growing weakness in the development of semiology and clinical skills, overvaluation through technology, and therefore, dependence on the results of complementary studies. The clinical method is learned and improved throughout the physician's working life, since it is applied in all specialties and scenarios where a patient is attended. It does not turn its back on the scientific advances of Medicine, but rather enables timely diagnosis, prognosis and specific therapeutics.[19,20,21]

In relation to the above-mentioned problems, the components of the clinical method for the diagnosis of postoperative peritonitis included, firstly, the personalized interrogation of the patient with unsatisfactory evolution after abdominal surgery, Secondly, the general and abdominal physical examination in particular.

Finally, the clinical reasoning[22,23] which includes the information obtained from the patient and the exhaustive review of the medical records to find clinical and surgical data of interest. Very important in this context is the surgeon-nurse-patient-family member communication cycle, which is developed with ethics and humanism.[23,24]

CONCLUSIONS

The design of the procedural invariants of the early diagnostic skills and therapy of postoperative peritonitis represents a teaching tool in the necessary permanent and continuous improvement of surgeons, contributing to the improvement of professional performance in this type of patient.

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Complementary files (Open Data):
- Prueba de desempeño inicial aplicada a los cirujanos (prueba de conocimientos teórica) [Initial performance test applied to surgeons (theoretical knowledge test)]
- Estudio de casos múltiples mediante prueba de desempeño final (prueba de conocimientos teórica) [Multiple case study by final performance test (theoretical knowledge test)]
- Prueba de desempeño final en el Entrenamiento (aprendizaje basado en problemas) [Final performance test in Training (problem-based learning)]