# Indicators and Measurement Matrix to Face COVID-19 at an University Hospital

Indicators and Measurement Matrix to Face COVID-19 at an University Hospital
Indicadores y Matriz de Medidas para COVID-19 en un Hospital Universitario

**RESUMO**
**Objetivo:** Selecionar os indicadores e construir a matriz de medidas para a conclusão do estudo de avaliabilidade do Plano de Contingência do Hospital Universitário de Brasília para Enfrentamento da covid-19. **Métodos:** Foi realizado no Hospital Universitário de Brasília entre maio de 2021 e novembro de 2022. A ferramenta S.M.A.R.T. e o princípio de Pareto apoiaram a seleção dos indicadores. Os parâmetros foram definidos por informantes-chave, por meio do contrato com a Secretaria de Saúde do Distrito Federal ou obtidos na literatura. **Resultados:** A matriz de medidas foi construída com ponto de corte em três estágios. Os 26 indicadores e a matriz de medidas foram validados pelos informantes-chave. **Conclusão:** A pandemia impôs desafios aos serviços de saúde, que precisaram se adequar para fornecer segurança aos trabalhadores em saúde e atendimento oportuno e de qualidade aos usuários. O estudo de avaliabilidade contribuiu para a tomada de decisão e recomendou o início do processo avaliativo.
**DESCRITORES:** Planos de Contingência; Covid-19; Hospitais Universitários; Indicadores de Gestão; Estudo de Avaliabilidade; Estudo de Avaliação.

**ABSTRACT**
**Objective:** To select indicators and construct a matrix of measures for completing the study of the evaluability of the Contingency Plan of the University Hospital of Brasília for Combating COVID-19. **Methods:** The study was conducted at the University Hospital of Brasília between May 2021 and November 2022. The S.M.A.R.T. tool and the Pareto principle supported the selection of indicators. The parameters were defined by key informants, through a contract with the Federal District Health Secretariat, or obtained from the literature. **Results:** The measurement matrix was constructed with a cutoff point in three stages. The 26 indicators and the measurement matrix were validated by key informants. **Conclusion:** The pandemic posed challenges to health services, which had to adapt to provide safety to health workers and timely, quality care to users. The assessability study contributed to decision-making and recommended the start of the evaluation process.
**DESCRIPTORS:** Contingency Plans; COVID-19; Hospitals, University; Management Indicators; Evaluation Study.

**RESUMEN**
**Objetivo:** Seleccionar los indicadores y construir la matriz de medidas para la conclusión del estudio de evaluabilidad del Plan de Contingencia del Hospital Universitario de Brasilia para hacer frente a la COVID-19. **Métodos:** Se llevó a cabo en el Hospital Universitario de Brasilia entre mayo de 2021 y noviembre de 2022. La herramienta S.M.A.R.T. y el principio de Pareto sirvieron de apoyo para la selección de los indicadores. Los parámetros fueron definidos por informantes clave, mediante un contrato con la Secretaría de Salud del Distrito Federal, u obtenidos de la bibliografía. **Resultados:** La matriz de medidas se construyó con un punto de corte en tres etapas. Los 26 indicadores y la matriz de medidas fueron validados por los informantes clave. **Conclusión:** La pandemia impuso desafíos a los servicios de salud, que tuvieron que adaptarse para proporcionar seguridad a los trabajadores sanitarios y una atención oportuna y de calidad a los usuarios. El estudio de evaluabilidad contribuyó a la toma de decisiones y recomendó el inicio del proceso de evaluación.
**DESCRIPTORES:** Planes de Contingencia; COVID-19; Hospitales Universitarios; Indicadores de Gestión; Estudio de Evaluabilidad; Estudio de Evaluación.

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## INTRODUCTION

The pandemic caused by the new coronavirus, known as COVID-19, has forced the rapid reorganization of health systems to prevent the saturation and collapse of services provided to the population. During the years 2020 to 2022, it became a priority to restructure public and private health networks so that services could care for users with COVID-19, in addition to


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ensuring the continuity of treatment for other diseases and conditions, such as pregnant women, users with chronic diseases, and urgent and emergency care unrelated to COVID-19[1].

The established flows aimed at actions to control the transmission of COVID-19 and, above all, to expand the capacity of the hospital network to meet the high demand from users who needed hospitalization, with the creation of new intensive care unit (ICU) beds and the acquisition of mechanical ventilation equipment[2].

The University Hospital of Brasília (HUB-UnB/Ebserh) belongs to the University of Brasília (UnB) and is linked to the Brazilian Hospital Services Company (Ebserh). The hospital participated in the strategies of the Federal District State Health Secretariat (SES-DF) to address the Public Health Emergency of International Concern (ESPII), acting in support of the Health Care Network (RAS-DF)[3].

The hospital established the Contingency Plan of the University Hospital of Brasília to Combat COVID-19 (PC COVID-19 HUB-UnB/Ebserh) with the purpose of reorganizing its care services as agreed with SES-DF. The plan was developed based on the technical and scientific recommendations of the competent health agencies and the Ebserh Network[4]. The main problem solved by the actions described in the plan was the disproportion between the care capacity of HUB-UnB/Ebserh and the increase in demand due to the COVID-19 pandemic in the Federal District[5].

The hospital management team, in partnership with researchers from UnB, proposed an evaluation of the plan in order to provide information about the application of the HUB-UnB/Ebserh COVID-19 CP[6]. Health evaluation studies have gained prominence and importance in recent times with the aim of systematizing and confirming the reliability of the results of the interventions implemented, becoming a useful tool for managing the emerging health crisis[7] .

The evaluability study is used as a preliminary step to the evaluation, aiming to verify whether the intervention has the necessary conditions to undergo an evaluation process. For this reason, the evaluability study is considered a pre-evaluation study. The evaluability study consists of different stages, from the documentary analysis of the intervention to the preparation of the matrix of measures, which will support the evaluation. Thus, it will allow understanding the functioning of the intervention, identifying problems and possible improvements[8,9] .

In the stage of preparing the evaluation questions, the appropriate indicators are selected to answer them in order to monitor the performance of the intervention or the progress of its implementation, empirically measuring the behavior of the expected criteria[10]. Donabedian[11] proposed that indicators for evaluating the quality of healthcare should be structured based on the components of structure, process, and outcome.

The final stage of the evaluability study is the development of a measurement matrix, a tool created from the selected indicators that will assist in the assessment of the intervention. It demonstrates the causal relationship between the intervention and its effect, evaluating the data obtained and allowing the monitoring of the relevance, theoretical foundations, productivity, and performance of the intervention according to the context in which it is inserted[7].

This study aims to select the indicators and construct the measurement matrix for the conclusion of the PC covid-19 HUB-UnB/Ebserh evaluability study.

## METHOD

This study was conducted between May 2021 and November 2022 at HUB-UnB/Ebserh. This is the second part of the PC covid-19 HUB-UnB/Ebserh evaluability study. The first part consisted of concatenated stages of document analysis, selection of key informants, elaboration and validation of the problem tree and context factors, and construction of the logical model[5].

The logical model schematically represented the functioning of the HUB-UnB/Ebserh COVID-19 PC and was divided into seven components[5]. Based on its products, appropriate indicators were selected by the research team to assess the performance of the HUB-UnB/Ebserh COVID-19 PC. To define the number of indicators, the Pareto principle[12]was used, which states that 80% of results originate from only 20% of causes. The S.M.A.R.T. tool supported the selection of indicators that should be specific, measurable, achievable, relevant, and timely[13]. The indicators were classified into structure, process, and result[11].

The validation of the indicators was carried out through an in-person workshop at HUB-UnB/Ebserh organized by the research team. It was attended by 18 key informants appointed by the hospital's governance, representing all components of the logical model. These informants were selected by the management team. These individuals held management positions (managers, division, sector, or unit heads) or leadership roles in the hospital (statistics manager, superintendent advisor, among others) for each of the seven components. They assisted in drafting and implementing the contingency plan and collected the data necessary for constructing the indicators. The TCLE was applied to key informants in the first stage of the study.

The participants were divided into

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four groups to discuss the indicators, assessing the relevance, usefulness, and availability of the data. After this stage, the participants returned to the large group, where they presented their suggestions for changes, and everyone present was able to collaborate in validating the indicators. In a second round of discussions, the parameters for each indicator were also agreed upon in a participatory manner with the help of key informants from each component. In this stage, the period and frequency for data collection were also defined, as well as those responsible for providing the information (focal points). The meeting was recorded with the consent of all participants. The data were transcribed and entered into a spreadsheet, in accordance with the meeting's deliberations, and the systematized data were reviewed against the recordings by another member of the research team.

After the research team organized the information, the focal points were contacted to confirm the availability of data for the selected indicators for each component and to define the best way to collect them, establishing communication flows for the subsequent phase.

To construct the measurement matrix, parameters, expected values, and cut-off points were developed for each indicator[7]:

- The parameter (p) constituted the reference value for measuring the indicator. These values were provided by the key informants themselves during the workshop, were part of the goals contracted with SES-DF, or were based on data available in the literature.
- To define the expected value of each indicator, it was assumed that each component of the logical model would contribute 100 points to the measurement matrix. Thus, according to the number of indicators in the component, this score was divided among them;
- The observed value will be the result found for each indicator after data collection and application of its calculation formula; - The cut-off points correspond to the conversion of the observed value into a score for the indicator assessment. Three cut-off points were defined for each indicator. Based on the expected values, maximum, intermediate, and minimum value ranges were defined. The maximum score will be assigned to observed values greater than or equal to the parameter value (≥p); intermediate score, for observed values less than the parameter and greater than or equal to half the parameter ($p/2 \leq x < p$); and minimum score for less than half the parameter ($< p/2$).

The measurement matrix was agreed upon and approved by the HUB-UnB/Ebserh governance in a virtual meeting held by Microsoft Teams® in November 2022.

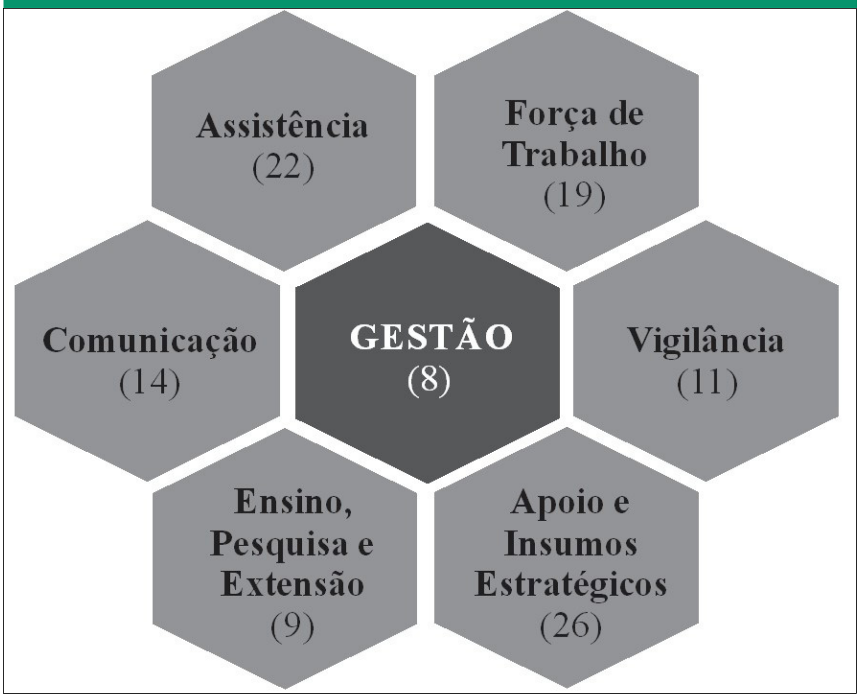
This study was submitted to the Ethics Committee of the Faculty of Ceilândia (CEP/FCE/UnB) by CAAE No. 32612620.8.0000.8093 and approved by opinion No. 4,083,274 on June 11, 2020.

## RESULTS

From the seven components and 109 products (Figure 1), which had been validated for the logical model of the PC covid-19 HUB-UnB/Ebserh[5], 26 indicators were selected and validated, as can be seen in

Table 1. Three structure indicators (11.5%), 17 process indicators (65.4%), and six outcome indicators (23.1%) were identified.

**Figure 1. Components of the Contingency Plan of the University Hospital of Brasília to combat COVID-19 (HUB-UnB/Ebserh) and number of products assigned to each component in the Logical Model, Brasília (2022)**




Source: Own work, based on the validated logic model (MEINERS et al, 2024).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In the 'Management' component, the indicator was intended to verify the adequacy of the versions of the HUB-UnB/Ebserh COVID-19 CP to those established by the Ebserh Headquarters models. For the 'Assistance' component, five indicators were selected, based on the participation of HUB-UnB/Ebserh as a backup in the SES-DF strategies to combat ESPII[3] , in addition to the management contract signed between the two institutions[14] . For two indicators (2.4 and 2.5), the parameters were established based on a study that evaluated severe cases of COVID-19 in Brazil[15].

In the 'Workforce' component, three indicators were related to the number of available employees (3.1, 3.2, and 3.5) and two to training to tackle the pandemic. To define the parameter regarding the need for frontline professionals, the guidelines established by the Federal Council of Medicine[16], Federal Nursing Council[17] and the Brazilian Association of Cardiorespiratory and Physiotherapy in Intensive Care[18] were evaluated, recommending a new ratio of healthcare professionals to beds in the Intensive Care Unit (ICU) for COVID-19. For 30 beds or a fraction of a COVID-19 ICU, per shift, three doctors, six nurses, 24 nursing technicians, and five physical therapists are required. Cofen also recommends applying a Technical Safety Index (TSI) of 20% due to the absence of professionals during the pandemic[17].

In the "Surveillance" component, the indicators tracked COVID-19 cases among users and employees, COVID-19 vaccination coverage among employees, and specific training during the pandemic.

For the 'Support and Strategic Inputs' component, the selected indicators demonstrated the management of the availability and adequate consumption of health products and medicines essential for tackling the pandemic. In addition, one indicator compared the use of disinfectants for critical areas before (2019) and during the pandemic (2020 and 2021).

In the 'Teaching, Research, and Extension' component, the indicators evaluated new research submitted to the hospital and the performance of residents and interns during the pandemic. Finally, in the 'Communication' component, the selected indicators aimed to demonstrate the effectiveness of internal and external communication activities established by the hospital during the pandemic.

**Table 1. Matrix of indicators of the Contingency Plan of the University Hospital of Brasília to combat COVID-19 by component, Brasília (2022)**

| Component 1: Management | | | | |
|---|---|---|---|---|
| Indicator (Type) | Purpose | Formula | Frequency (Start of collection) | Parameter |
| 1.1. Percentage of adherence of the PC covid-19 HUB-UnB/Ebserh to the Ebserh Headquarters model (result) | Measure the actions contained in the versions of the PC covid-19 HUB-UnB/Ebserh, in relation to the model proposed by Ebserh Headquarters | (number of actions contained in the PC covid-19 HUB-UnB/Ebserh/total number of actions that should be included in the PC)*100 | PC version (March/2020) | 80%[a] |
| Component 2: Assistance | | | | |
| Indicator (Type) | Purpose | Formula | Frequency (Start of collection) | Parameter |
| 2.1. Percentage of COVID bed conversion (structure) | Measure the beds designated to serve users with COVID-19 in relation to the contract with SES-DF | (number of COVID beds/total number of COVID beds agreed with SES-DF)*100 | Monthly (May/2020) | 75%[b] |
| 2.2. Percentage of deliveries performed (result) | Measure the deliveries performed at HUB-UnB/Ebserh in relation to those contracted with SES-DF | (number of deliveries performed/ number of deliveries provided for in the SES-DF contract)*100 | Monthly (March/2020) | 90%[b] |
| 2.3. Percentage of oncological surgeries performed (result) | Measure the number of cancer surgeries performed at HUB-UnB/Ebserh in relation to the number contracted with SES-DF | (number of cancer surgeries performed/ number of cancer surgeries provided for in the SES-DF contract)*100 | Monthly (March/2020) | 90%[b] |
| 2.4. COVID-19 fatality rate (result) | Measure mortality among users with COVID-19 | (number of deaths among users with COVID-19/total number of users with COVID-19 hospitalized)*100 | Monthly (May/2020) | 27%[c] |
| 2.5. Average length of hospital stay for users with COVID-19 (process) | Measure the length of hospital stay for users with COVID-19, in days | Length of hospital stay for users with COVID-19 (T1+...Tz)/total number of users with COVID-19 hospitalized | Monthly (May/2020) | 14 days[c] |
| Component 3: Workforce | | | | |
| Indicator (Type) | Purpose | Formula | Frequency (Start of collection) | Parameter |

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|---|---|---|---|---|
| 3.1. Percentage of employees who are part of risk groups (process) | Measure the number of employees who are part of risk groups for COVID-19 | (number of employees on leave due to risk/total number of employees)*100 | Semiannual (March/2020) | 10%[a] |
| 3.2. Percentage of employees working on the front line (structure) | Measure the proportion of employees working in direct care for suspected or confirmed cases of COVID-19 | (number of professionals working on the front line/total number of employees)*100 | Monthly (March/2020) | 5%[d] |
| 3.3. Percentage of employees trained in realistic simulation (process) | Measure the proportion of frontline employees trained in realistic simulation | (number of professionals trained in realistic simulation/total number of frontline employees)*100 | Semiannual (March/2020) | 80%[a] |
| 3.4. Percentage of outsourced employees trained (process) | Measure the proportion of outsourced employees trained to deal with the pandemic | (number of trained outsourced professionals/total number of outsourced employees)*100 | Semiannual (March/2020) | 80%[a] |
| 3.5. Percentage of vacancies filled in the simplified selection process (structure) | Measure the proportion of temporary employees hired for positions through a simplified selection process | (number of temporary employees hired/ number of positions approved for simplified selection process)*100 | Semiannual (March/2020) | 80%[a] |
| Component 4: Surveillance | | | | |
| Indicator (Type) | Purpose | Formula | Frequency (Start of collection) | Parameter |
| 4.1. Positivity rate of hospitalized users (process) | Measure intra-hospital transmission of COVID-19 among users | (number of nosocomial COVID-19 cases/number of confirmed COVID-19 cases in users)*100 | Monthly (January/2021) | 2%[a] |
| 4.2. Percentage of employees on leave due to COVID-19 (process) | Measure the proportion of confirmed COVID-19 cases among employees | (number of confirmed COVID-19 cases among employees/total number of employees)*100 | Monthly (April/2020) | 3%[a] |
| 4.3. Percentage of employees vaccinated against COVID-19 (process) | Measure the proportion of employees vaccinated against COVID-19, per dose | (number of employees vaccinated against COVID-19/total number of employees)*100 | Vaccine dose (January/2021) | 70%[e] |
| 4.4. Percentage of employees trained by the Health Surveillance Unit (process) | Measure the proportion of employees trained by the Health Surveillance Unit in prevention and control protocols during the pandemic (number of employees trained by the Health Surveillance Unit/total number of employees)*100 | Semiannual (March/2020) | 50%a | 50%[a] |
| Component 5: Strategic Support and Inputs | | | | |
| Indicator | Purpose | Formula | Frequency (start of collection) | Parameter |
| 5.1. Percentage of N95 mask consumption (process) | Measure the consumption of N95 masks in relation to stock | (number of N95 masks consumed in the month/stock of N95 masks on the last day of the previous month)*100 | Monthly (April/2020) | 80%[a] |
| 5.2. Percentage of foam alcohol consumption (process) | Measure foam alcohol consumption in relation to stock | (amount of foam alcohol consumed in the month/foam alcohol inventory on the last day of the previous month)*100 | Monthly (April/2020) | 80%[a] |
| 5.3. Increase in monthly consumption of disinfectant for critical areas (process) | Measure the increase in monthly consumption of disinfectant in critical areas during the pandemic, compared to consumption in the same month in 2019 | [(number of gallons of disinfectant consumed in the month)/ (number of gallons of disinfectant consumed in the month in 2019)-1]*100 | Monthly (March/2020) | greater than 0[a] |
| 5.4. Percentage of midazolam consumption (process) | Measure midazolam consumption for sedation of COVID-19 patients (10 mL ampoule) in relation to stock | (amount of 10mL midazolam consumed in the month/stock of 10mL midazolam on the last day of the previous month)*100 | Monthly (March/2020) | 80%[a] |
| 5.5. Percentage of subcutaneous heparin consumption (process) | Measure subcutaneous heparin consumption for the treatment of COVID-19 complications in relation to stock | (amount of subcutaneous heparin consumed in the month/stock of subcutaneous heparin consumed on the last day of the previous month)*100 | Monthly (March/2020) | 80%[a] |
| Component 6: Teaching, Research, and Extension | | | | |
| Indicator (Type) | Purpose | Formula | Frequency (Start of collection) | Parameter |


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|---|---|---|---|---|
| 6.1. Percentage of searches related to COVID-19 (process) | Measure the number of COVID-19 research projects approved by HUB-UnB/Ebserh | (number of new COVID-19 research projects/number of research projects on all subjects)*100 | Semiannual (March/2020) | 60%[a] |
| 6.2. Percentage of residents directly involved in the care of users with COVID-19 (process) | Measure residents directly involved in the care of users with COVID-19 | (number of residents directly involved in the care of COVID-19 patients/total number of residents)*100 | Semiannual (March/2020) | 100%[a] |
| 6.3. Percentage of students in mandatory internships (process) | Measure the number of students in mandatory internships during the pandemic, compared to 2019 | (number of students in mandatory internships during the pandemic/number of students in mandatory internships in the same semester in 2019)*100 | Semester (March/2020) | 50%[a] |
| 6.4. Percentage of boarding school students in activity (process) | Measure the number of internship students active during the pandemic, compared to 2019 | (number of boarding students during the pandemic/number of boarding students in the same semester in 2019)*100 | Semester (March/2020) | 50%[a] |
| Component 7: Communication | | | | |
| Indicator (Type) | Purpose | Formula | Frequency (Start of collection) | Parameter |
| 7.1. Scope of internal communication about COVID-19 (result) | Measure the reach of internal communication through news about COVID-19 on the intranet | Number of views of news about COVID-19 on the intranet/number of news items about COVID-19 on the intranet | Monthly (March/2020) | 350/ news items |
| 7.2. Percentage of negative repercussions on COVID-19 (result) | Measure the proportion of press requests about COVID-19 that generated negative repercussions for HUB-UnB/Ebserh | (number of press requests about COVID-19 with negative repercussions/number of press requests about COVID-19)*100 | Monthly (March/2020) | 10%[a] |
| 7.2. Percentage of negative repercussions on COVID-19 (result) | Measure the proportion of press requests about COVID-19 that generated negative repercussions for HUB-UnB/Ebserh | (number of press requests about COVID-19 with negative repercussions/number of press requests about COVID-19)*100 | Monthly (March/2020) | 10%[a] |

Source: Own work, based on the validated ML and parameters established by key informants, SES-DF, and literature

Caption: PC covid-19 HUB-UnB/Ebserh: Contingency Plan of the University Hospital of Brasília to combat covid-19; HUB-UnB/Ebserh: University Hospital of Brasília; SES-DF: Federal District Health Secretariat; aProvided by key informants; bContracted with SES-DF; cPerazzo et al (2022); dCFM (2020)/ Cofen (2020)/ ASSOBRAFIR (2020); eWHO (2022)

Thus, the matrix of measures was developed based on the selected indicators and parameters established in Table 1 to define expected values and cut-off points. The validated matrix of measures is shown in Table 2.

**Table 2. Matrix of measures of the Contingency Plan of the University Hospital of Brasília to combat COVID-19 by component, Brasília (2022)**

| Component | Indicator | Parameter | Expected value | Cut-off point* |
|---|---|---|---|---|
| Management | 1.1. Percentage of adherence of the PC covid-19 HUB-UnB/Ebserh to the Ebserh Headquarters model | 80%[a] | 100 | 100 pontos, se ≥80%<br>50 pontos, se 40≤x<80%<br>0 pontos, se <40% |
| Care | 2.1. Percentage of COVID bed conversion | 75%[b] | 20 | 20 pontos, se ≥75%<br>10 pontos, se 37,5≤x<75%<br>0 pontos, se <37,5% |
| | 2.2. Percentage of deliveries performed | 90%[b] | 20 | 20 pontos, se ≥90%<br>10 pontos, se 45≤x<90%<br>0 pontos, se <45% |
| | 2.3. Percentage of oncological surgeries performed | 90%[b] | 20 | 20 pontos, se ≥90%<br>10 pontos, se 45≤x<90%<br>0 pontos, se <45% |
| | 2.4. COVID-19 case fatality rate | 27%[c] | 20 | 20 pontos, se ≤27%<br>10 pontos, se 40,5≤x>27%<br>0 pontos, se >40,5% |
| | 2.5. Average length of hospital stay for COVID-19 patients | 14 daysc | 20 | 20 pontos, se ≤14 dias<br>10 pontos, se 21≤x>14 dias<br>0 pontos, se >21 dias |

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|---|---|---|---|---|
| Workforce | 3.1. Percentage of employees who are part of risk groups | 10%a | 20 | 20 pontos, se ≤10%<br>10 pontos, se 10>x≤20%<br>0 pontos, se >20% |
| | 3.2. Percentage of employees working on the front line | 5%d | 20 | 20 pontos, se ≥5%<br>10 pontos, se 2,5≥x<5%<br>0 pontos, se <2,5% |
| | 3.3. Percentage of employees trained in realistic simulation | 80%a | 20 | 20 pontos, se ≥80%<br>10 pontos, se 40≥x<80%<br>0 pontos, se <40% |
| | 3.4. Percentage of trained outsourced employees | 80%a | 20 | 20 pontos, se ≥80%<br>10 pontos, se 40≥x<80%<br>0 pontos, se <40% |
| | 3.5. Percentage of places filled in the simplified selection process | 80%a | 20 | 20 pontos, se ≥80%<br>10 pontos, se 40≥x<80%<br>0 pontos, se <40% |
| Surveillance | 4.1. Positivity rate of hospitalized users | 2%a | 25 | 25 pontos, se ≤2%<br>12,5 pontos, se 4≤x>2%<br>0 pontos, se >4% |
| | 4.2. Percentage of employees absent due to COVID-19 | 3%a | 25 | 25 pontos, se ≤3%<br>12,5 pontos, se 4,5≤x>3%<br>0 pontos, se >4,5% |
| | 4.3. Percentage of employees vaccinated against COVID-19 | 70%e | 25 | 25 pontos, se 70%<br>12,5 pontos, se 35≥x<70%<br>0 pontos, se <35% |
| | 4.4. Percentage of employees trained by the Health Surveillance Unit | 50%a | 25 | 25 pontos, se ≥50%<br>12,5 pontos, se <50 e ≥25%<br>0 pontos, se <25% |
| Support and Strategic Inputs | 5.1. Percentage of N95 mask consumption | 80%a | 20 | 20 pontos, se ≤80%<br>10 pontos, se 90≤x<80%<br>0 pontos, se >90% |
| | 5.2. Percentage of foam alcohol consumption | 80%a | 20 | 20 pontos, se ≤80%<br>10 pontos, se 90≤x<80%<br>0 pontos, se >90% |
| | 5.3. Increase in monthly consumption of disinfectant for critical areas | >0%a | 20 | 20 pontos, se >0%<br>0 pontos, se ≤0% |
| | 5.4. Percentage of midazolam consumption | 80%a | 20 | 20 pontos, se ≤80%<br>10 pontos, se 90≤x<80%<br>0 pontos, se >90% |
| | 5.5. Percentage of subcutaneous heparin consumption | 80%a | 20 | 20 pontos, se ≤80%<br>10 pontos, se 90≤x<80%<br>0 pontos, se >90% |
| Teaching, Research, and Outreach | 6.1. Percentage of research on COVID-19 | 60%a | 25 | 25 pontos, se ≥60%<br>12,5 pontos, se 30≤x<60%<br>0 pontos, se <30% |
| | 6.2. Percentage of residents directly involved in the care of users with COVID-19 | 100%a | 25 | 25 pontos, se 100%<br>12,5 pontos, se 50≤x<100%<br>0 pontos, se <50% |
| | 6.3. Percentage of students in mandatory internships | 50%a | 25 | 25 pontos, se ≥50%<br>12,5 pontos, se 25≤x<50%<br>0 pontos, se <25% |
| | 6.4. Percentage of boarding school students in activity | 50%a | 25 | 25 pontos, se ≥50%<br>12,5 pontos, se 25≤x<50%<br>0 pontos, se <25% |


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|---|---|---|---|---|
| Communication | 7.1. Scope of internal communication about COVID-19 | 350/newsa | 50 | 50 pontos, se ≥350<br>25 pontos, se 175≤x<350<br>0 pontos, se <175 |
| | 7.2. Percentage of negative repercussions on COVID-19 | 10%a | 50 | 50 pontos, se ≤10%<br>25 pontos, se 10%<x≤20%<br>0 pontos, se >20% |

The interpretation of an 80% parameter on employee training in the 'Workforce' component, for example, would score 20 if 80% or more employees were trained, ten points if between 40% and 80% were trained, and zero points if less than 40% of employees were trained. However, to determine the meaning of the cutoff point, it was necessary to analyze with key informants the purpose of each indicator and its contribution to achieving the intermediate results described in the validated logical model[5]. Thus, in the analysis of the consumption of health products and medicines in the 'Support and Strategic Inputs' component, although the parameter is the same as mentioned above (80%), the purpose of the indicators is related to maintaining a minimum stock of products to avoid shortages. Thus, the cutoff score would be 20 points if the stock consumed were less than or equal to 80%; ten points, between 80% and 90%; and zero points, if greater than 90%. The logic of interpreting the cutoff points for these indicators is reversed, but the intermediate value was maintained at 50% of the parameter.

## DISCUSSION

The evaluation methods are well described in the literature, but they are heterogeneous in their design and adapted to the particularities of each theme and context. In the case of evaluability studies, the designs and methodologies are also quite variable. Baratieri[9], in an integrative review on the topic, observed an increase in evaluability studies over time (1979 to 2011). In this review, it was found that most of the studies evaluated adopted a guiding theoretical framework, but less than 30% of the studies were collaborative and presented a matrix of measures or indicators. Some studies advanced in the development of indicators, such as that by Pereira[19], which evaluated qualitative and quantitative indicators.

In quantitative indicators, cut-off values were established at three cutoff points, as was done in this study. Due to the speed imposed by the pandemic, process indicators were prioritized in this study (65.4%), aiming to optimize solutions based on available resources. It was also possible to include some outcome indicators (23.1%), since COVID-19 presents rapid clinical evolution and allows for short-term monitoring of results. The study by Migoto, Oliveira, and Freire[20] established indicators for assessing the quality of prenatal care and also constructed indicators based on the Donabedian triad. Most of the indicators were process indicators (42%), followed by structure (33%) and outcome (25%), in line with the data observed in this assessability study, since the characteristics of evolution allow for the assessment of short-term outcomes.

Santos et al[2]conducted a documentary study of the official websites of 44 Federal University Hospitals (HUF) in the Ebserh network and identified 495 actions to tackle the COVID-19 pandemic, allocated between 'Care' (38.99%), 'Management' (37.58%), 'Extension' (16.16%), and 'Teaching and Research' (7.27%), which, according to the authors, are the most important areas of activity for the HUFs. This information corroborates the definitions of components in this study, which also evaluated the components 'Workforce', 'Surveillance', 'Support and Strategic Inputs', and 'Communication'.

The use of only one indicator for the 'Management' component was sufficient, since it is part of the monitoring panel of all university hospitals in the Ebserh network. Based on the contingency plans developed and monitored, Ebserh sought solutions and financing to support the fight against COVID-19 in its units, such as simplifying temporary hiring processes and purchasing supplies and equipment through the network[4].

The indicators of the 'Care' component were important for understanding the dynamics used by the hospital in caring for COVID-19 patients and other users. The hospital dealt with fluctuations in the number of COVID-19 cases in the Federal District and with serious cases referred via the Federal District's central regulation system. The hospital acted as a backup for the RAS/DF, receiving patients from the Asa Norte Regional Hospital (HRAN)[3]. In addition, it expanded its care for pregnant women and maintained other essential services, such as cancer surgery and hemodialysis services. The study by Duarte et al.[22]identified high percentages of discontinuity in elective surgeries, rehabilitation services, diagnosis and treatment of chronic noncommunicable diseases, treatment of mental disorders, diagnosis and treatment of cancer, and palliative care in the state of São Paulo.

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The 'Workforce' component aimed to monitor employee dynamics to adapt to the demands imposed by ESPII. With the pandemic, many employees who were part of the COVID-19 risk group had to be removed from work(23) ,and there was a shortage of health professionals due to high demand in the labor market generated by the health crisis[24] . According to managers, it was necessary to reassign employees from their duties at the hospital in order to supplement the frontline care schedule for COVID-19 patients. These professionals were trained in different topics related to caring for people with COVID-19, including the use of realistic simulations.

The Quality Management Sector is strategic for Epidemiological Surveillance at HUB-UnB/Ebserh and encompasses the Quality and Patient Safety Management Unit and the Health Surveillance Unit[4] . During the pandemic, health services maintained control of nosocomial transmission among users and employees. Starting in February 2021, HUB-UnB/Ebserh participated in a phase III clinical trial on the efficacy and safety of the COVID-19 vaccine (CoronaVac, Sinovac Life Sciences, Beijing, China), and its employees were among the first in the country to be immunized[25] . With the advancement of the availability of COVID-19 vaccine doses, the hospital's goal was to reach the parameter recommended by the WHO, that is, above 70% coverage among employees.

The "Support and Strategic Supplies" component involved essential supplies for the prevention, protection, and care of employees and users with COVID-19. During the pandemic, there was a shortage of personal protective equipment (N95 masks) and hand hygiene products (alcohol gel, alcohol foam), which are essential for preventing intra-hospital transmission of COVID-19[27]. There was also a shortage of some critical medications, such as anesthetics, cardiotonics, antibiotics, and anticoagulants[28]. Thus, the selected indicators sought to elucidate the dynamics of acquisition and management of the consumption of these supplies.

With the advent of COVID-19, research on the disease increased significantly to elucidate the particularities of human infection by the new virus[29]. Thus, the Teaching and Research Management (GEP) prioritized research on the topic. During the pandemic, student activities at the hospital were suspended due to the risk of infection, increased user demand, the impossibility of supervision by preceptors, and the unavailability of hospital staff to assist them. However, interns from the 'O Brasil Conta Comigo' Brazil Counts on Me program and interns in their final year of Pharmacy, Nursing, and Physical Therapy courses, as well as medical interns, were retained. Medical and multidisciplinary residencies were also maintained during this period, and residents, whenever possible, provided direct care to users with COVID-19, as an opportunity to work in a ESPII.

The Communication Unit, linked to the hospital's Superintendent's Office [4], developed the plan to ensure effective internal and external communication within the hospital in transmitting information to employees, users, family members, and the press. In emergency situations, institutional crisis offices need to rely on communication specialists.

## CONCLUSION

Upon completing the selection of indicators and the construction of the measurement matrix with the validation of the two tools by the stakeholders, the assessability study was finalized, recommending the start of the evaluation study.

The completion of the PC covid-19 HUB-UnB/Ebserh assessability study provided input to local management for decision-making and equipped the research team to begin evaluating the implementation. For the stakeholders, it was an opportunity to revisit the plan based on the logical model and compare it with the actions proposed for the different sectors and service units, with the opportunity to develop measurable and viable indicators to assess its performance[4]. In this way, it contributed to decision-making and the analysis of the feasibility of submitting the intervention to an evaluation process.

As it was a participatory study, both the hospital management and employees contributed to all stages. Fourth-generation evaluation is a constructivist methodology in which stakeholders engage in dialogue throughout the evaluation process—planning, programming, execution, and evaluation of interventions. Kantorski et al[32] noted strong team adherence to participatory evaluation, which, equipped with protagonism from the negotiation stages of the evaluation process, enabled critical reflections and advances in service improvements.

On the other hand, there was a limitation due to the limited time that the actors involved could devote to the research, given the demands and responsibilities imposed by the COVID-19 pandemic, which extended the study's duration. Conducting several stages of the research remotely was an innovation that enabled the project to continue during the period when external researchers were prevented from being present at the hospital.

During the COVID-19 pandemic, agile and effective responses were necessary to combat the disease in order to avoid overloading the system and the worst outcomes for users. Health services needed to ensure timely, qua-


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lity treatment based on the best scientific evidence to preserve lives. Thus, the PC COVID-19 HUB-UnB/Ebserh evaluability study provided input to local management for the implementation of the aforementioned plan and the development of new contingency plans for future ESPIIs.

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