Improving quality of care

Strengthening primary health care by avoiding unnecessary hospitalizations in Romania

Health systems evaluation report
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Improving the quality of care

Strengthening primary health care by avoiding unnecessary hospitalizations in Romania

Health systems evaluation report
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Abbreviations

ICD-10  International Statistical Classification of Diseases and Related Health Problems, 10th revision
IQR     interquartile range
LRTI    lower respiratory tract infection
NSPHM   National School of Public Health and Management
PHC     primary health care
URTI    upper respiratory tract infection
Executive summary

Observations from completed WHO missions show that children and pregnant women with common conditions are often admitted to hospital when they could be safely managed in primary care. Previous observations also suggest that treatment of common childhood conditions often comprises multiple unnecessary and invasive drugs, which are not evidence-based and not in line with international guidelines.

With the overall goal of strengthening primary health care (PHC) in Romania, this health systems evaluation was carried out for three principal purposes:

1. to determine hospitalization rates in children and pregnant women between 2011 and 2020/2021 and to identify the main causes of hospitalization;
2. to quantify and understand the reasons for unnecessary and unnecessarily prolonged hospitalizations in children, pregnant women and women hospitalized for delivery; and
3. to assess and quantify antibiotic use and polypharmacy in children and pregnant women admitted to hospital for common conditions.

This health systems evaluation was conducted by WHO in collaboration with the Ministry of Health of Romania.

National data were collected from the National School of Public Health and Management under the Ministry of Health of Romania. In December 2021 WHO international and national consultants, including paediatricians and midwifery and public health professionals, visited 10 hospitals across the country to collect data on unnecessary hospitalizations and use of antibiotics and other drugs. In each hospital, 40 medical records of children, 40 of pregnant women and 40 of women hospitalized for delivery, hospitalized in 2019 and 2020, were randomly selected. Inclusion criteria for reviewing the selected records were:

1. hospitalized children aged 2–59 months with a primary diagnosis of acute respiratory infection (upper respiratory infections, pneumonia, acute bronchitis/bronchiolitis, other lower respiratory tract infections) or intestinal infection (diarrhoea);
2. hospitalized pregnant women with a primary diagnosis of premature labour, threatened abortion, premature ruptures of membranes, or mild to moderate pre-eclampsia; or
3. women with term pregnancy hospitalized for delivery.

Data were collected on baseline characteristics, antibiotics received prior to admission, and drugs prescribed during hospitalization. Reasons for hospitalization were assessed against defined standards of care and classified as necessary or unnecessary. Clinical development was reviewed and compared against predefined discharge criteria to assess whether hospitalizations were unnecessarily long.
**National hospitalization rates**

National data show that hospitalization rates in Romania were fairly stable between 2011 and 2019, with an average 214 hospitalizations per 1000 population per year. In 2020, coinciding with the COVID-19 pandemic, this indicator dropped to 130 hospitalizations per 1000 population per year. This decline occurred across all age groups and in pregnant women, and there was no significant increase in 2021. These data were confirmed by the analysis of monthly hospitalizations at the selected hospitals, except in the case of pregnant women, for whom the number of hospitalizations remained fairly stable. Provision of health-care services was disrupted by repurposing of some hospitals during 2020 as part of the COVID-19 response.

**Most common diagnoses for admitting children and pregnant women to hospital**

According to national data, acute respiratory infections (comprising interstitial lung disease, pneumonia and acute bronchiolitis), acute gastroenteritis, acute tonsillitis and neonatal jaundice were consistently reported among the 10 commonest diagnoses in hospitalized children between 2011 and 2020. In 2020, coinciding with the COVID-19 pandemic, the number of child hospitalizations due to acute respiratory infections decreased by more than half compared to 2019. In hospitalized pregnant women, threatened abortion, threatened premature labour, maternal care due to uterine scar from previous surgery, and delayed or excessive haemorrhage following abortion and ectopic and molar pregnancy were among the top 10 diagnoses every year between 2011 and 2020. Since 2015 delivery by caesarean section has remained more common than vaginal delivery.

**Review of medical records: main characteristics of children and pregnant women**

Across the 10 selected hospitals, 209 records for children, 349 for pregnant women, and 240 for women hospitalized for delivery were reviewed and included in the analyses. The median age of the children was 16 months. Among pregnant women and those hospitalized for delivery, the median age was 28 years; 16.6% of the pregnant women and 15.0% of those hospitalized for delivery were teenagers. Although most patients came to hospital of their own accord (without referral), 14.3% of children and 6.0% of pregnant women were referred from PHC or other hospitals. Some 25.8% of children and 20.6% of pregnant women were admitted at night (22:00–06:00). Around two thirds of children were hospitalized with a primary diagnosis of a respiratory infection, including pneumonia (20.1%), acute bronchiolitis (11.5%), upper respiratory tract infection (17.2%), croup (5.7%), acute bronchitis (4.3%) and unspecified lower respiratory tract infection (2.4%). The remaining children (38.8%) were hospitalized with a primary diagnosis of acute gastroenteritis, with no case of dysentery. Half the pregnant women were hospitalized with a primary diagnosis of threatened premature labour recorded at admission (53.3%). The remaining pregnant women were hospitalized with a primary diagnosis of threatened miscarriage (44.4%), moderate pre-eclampsia (1.7%) or premature rupture of membranes (0.6%). Anaemia was common in all the groups: children (27.8%), pregnant women (20.6%) and women hospitalized for delivery (45.8%). In addition, 44.2% of women hospitalized for delivery were diagnosed with hypogalactia, defined as insufficient milk secretion to maintain exclusive breastfeeding. Some secondary diagnoses (e.g. metabolic acidosis, oral or
digestive candidiasis) were reported in a high proportion of children in a few hospitals and in no children in the other hospitals.

Among women hospitalized for delivery, 11.7% had less than the recommended number of antenatal care visits during pregnancy and 14.2% had no antenatal care visits at all. The proportion of delivery by caesarean section varied between hospitals, with an average of 52.9%.

**Unnecessary hospitalizations**

Unnecessary hospitalizations were common, accounting for 57.9% (121/209) of hospitalizations in children and 56.2% (196/349) in pregnant women. The proportion of unnecessary hospitalizations was similar across the different diagnoses in children, ranging from 54.3% to 68.3%. In the case of unnecessary hospitalizations, fever was frequently mentioned as a reason for admitting children to hospital. By contrast, the proportion of unnecessary hospitalizations among pregnant women varied enormously, from 0.0% for two women with premature rupture of membranes or 7.1% for women hospitalized with threatened abortion, up to 96.2% for threatened premature labour and 100% for moderate pre-eclampsia (six women for the latter diagnosis).

There were no differences in the proportion of unnecessary hospitalizations between admission during the daytime (06:00–22:00) and at night (22:00–06:00) or between patients who were referred from PHC or other facilities and those who were not. However, the proportion of unnecessary hospitalizations was significantly higher among children who came by ambulance than among those who came by personal means. For children, the proportion of unnecessary hospitalizations ranged from 31.3% to 81.1% in the seven paediatric hospitals.

Hospitalizations of women hospitalized for delivery were not assessed as unnecessary or not, as all hospital deliveries are justified.

**Duration of hospitalization and unnecessarily prolonged hospitalizations**

Children were hospitalized for an average of 4.7 days and pregnant women for an average of 2.8 days. The duration of hospitalization did not differ between necessary and unnecessary hospitalizations.

All unnecessary hospitalizations were automatically classified also as unnecessarily prolonged. Of necessary hospitalizations, 44.4% (32/72) were unnecessarily prolonged in children and 23.3% (34/146) in pregnant women. In children, the highest proportion of unnecessarily prolonged hospitalizations was found among those hospitalized with pneumonia (71.4%), although this needs to be interpreted with caution because of the small number of children in each category. In pregnant women, the proportion of unnecessarily prolonged hospitalizations was not higher in teenagers than in nonteenagers.

In women hospitalized for delivery, unnecessarily prolonged hospitalization was defined – according to discharge criteria established by the Romanian Society of Obstetrics and Gynaecology and approved by the Ministry of Health of Romania – as a hospitalization longer than 48 hours after
vaginal delivery or 72 hours after caesarean section (a few extra hours were allowed when delivery occurred at night, as no woman would be expected to be discharged at that time). Based on these criteria, the hospitalization of 45.8% (110/240) of women and their babies was unnecessarily prolonged after delivery, representing 57.5% (65/113) of vaginal deliveries and 35.4% (45/127) of caesarean sections. Another 13 women (5.4%) were classified as prolonged hospitalizations, but with a condition that justified a longer stay: either a medical condition of the newborn (six cases) or the mother (four), or social cases (three).

**Effects of the COVID-19 pandemic on hospitalization practices**

We looked at the impact of the COVID-19 pandemic and the resulting lockdown (15 March–15 May 2020) on the proportion of unnecessary and unnecessarily prolonged hospitalizations. While a drop between the pre-pandemic period and the lockdown was expected, this was only seen for unnecessarily prolonged hospitalizations in pregnant women (which dropped from 27.6% to 10.5%) and for unnecessary hospitalizations in children (from 63.9% to 52.2%), and the differences were not statistically significant.

**Antibiotic use and polypharmacy**

Use of antibiotics was high among children and pregnant women – unnecessary in a considerable proportion of them and not based on evidence or in line with guidelines. Prior to admission, one in every five children received at least one antibiotic. Two thirds of children received at least one antibiotic during hospitalization, including most children with pneumonia (95.6%) and 53.1% of children with a primary diagnosis of acute gastroenteritis, despite no case of dysentery. Overall, 30.1% of pregnant women were prescribed antibiotics during hospitalization.

During their hospitalization, children received an average of four drugs and pregnant women three drugs, in addition to antibiotics, intravenous fluids and oxygen. Children and pregnant women were frequently prescribed medication when it was not indicated or there was no evidence of benefits; these included probiotics and mucolytics for children, and vitamins for pregnant women. One out of five children with acute gastroenteritis received trimebutine-based medicines, even though they are contraindicated in children under two years of age. The proportion of women who had just delivered receiving ergometrine seemed unjustifiably high.

**Perinatal care: observations**

We observed several practices still in place at the time of our visits that are not in line with current WHO and other international recommendations. In all hospitals, newborns were separated from their mothers just after birth, for at least 1–4 hours after vaginal delivery and at least 12–24 hours after caesarean section. Start of breastfeeding was almost invariably delayed, and overall there was a lack of breastfeeding support for mothers from health staff. These observations are likely to explain, in part at least, the high proportion of mothers discharged with a diagnosis of hypogalactia mentioned above. Partners or companions were not allowed to be present during delivery and during hospitalization until discharge of mother and baby. Finally, medicalization of noncomplicated
delivery and care for healthy newborns was observed, such as “preventive episiotomy” and routine suction of mouth and nose at birth, even though this is no longer recommended for newborns who start breathing on their own.

Next steps

Suggested actions to reduce unnecessary hospitalizations and strengthen PHC

Decreasing unnecessary hospitalizations will lead to substantial efficiency gains, in economic terms, both for families and for health systems, as well as to increasing patient safety. It is therefore proposed that:

- existing funding and financing mechanisms are reviewed for possible incentives that might encourage unnecessary hospitalization;
- capacity at PHC level is strengthened.

To this end, the following steps are proposed:

- The Ministry of Health to consider carrying out a root-cause analysis to gain a better understanding of the reasons for unnecessary hospitalization, with a focus on patient/parent and professional behaviour; this will involve:
  - key informant interviews with patients and caregivers to gain a better understanding of their perceptions of the quality of care provided at PHC facilities and hospitals and their reasons for seeking medical care;
  - key informant interviews with doctors to investigate the determinants of unnecessary hospitalization.

- The Ministry of Health and WHO to carry out further work to gain a better understanding of the root causes of unnecessary hospitalization and to engage in a participatory policy dialogue and apply system changes with the aim of strengthening PHC; this could include (among other things):
  - reviewing the differences in hospitalization rates alongside hospital bed occupancy rates;
  - strengthening PHC, including improving infrastructure, enhancing financing mechanisms and staff capacity-building, and promoting collaboration with social services (a finding of this study was that patients were admitted for social reasons, when medically not indicated, who could be better and more cheaply managed outside hospital if good PHC and social services were available);
  - strengthening care capacity at emergency departments and PHC (study findings included that children with wheeze who needed nebulization were admitted directly; many of
these children could be sent home safely after short treatment in emergency departments if good PHC were available); 

- developing and implementing a plan to raise awareness of the harm caused by unnecessary hospitalization; and engaging in a participatory policy dialogue with the population to find ways to improve the health-care system and avoid unnecessary harm.

- The Ministry of Health and WHO to consider extending the health systems evaluation of unnecessary hospitalizations to medical records of newborns in order to understand the possible reasons for unnecessarily prolonged hospitalization of women hospitalized for delivery and to evaluate current practice in the management and hospitalization of newborns. Regulations on timely discharge of mothers hospitalized for delivery should be revised: when the mother can be safely discharged from a medical point of view, she should be discharged; and if her baby needs further hospital care, she should be readmitted as a caregiver.

- Consideration should be given to extending the assessment to other areas, such as noncommunicable diseases and infectious diseases (including tuberculosis).

- The Ministry of Health and WHO to work to achieve a successful implementation of the *Pocket book of primary health care for children and adolescents* in order to strengthen management of childhood diseases at PHC level and thus reduce unnecessary hospitalizations.

- The Ministry of Health to consider regulating use of ambulances: implementing a triage system so that only patients who require emergency transport can access ambulance services; ensuring that frivolous use is penalized; and establishing a reimbursement system for use of taxis for low-income groups that cannot otherwise reach hospital.

- The Ministry of Health to review national data on pre-eclampsia detection. If the detection rate is low, an effective system of pre-eclampsia screening and management would be required.

- The Ministry of Health to investigate the detection of secondary diagnoses, such as metabolic acidosis and oral or digestive candidiasis, in hospitalized children, to avoid potential overdiagnosis of such conditions and hence unnecessary interventions.

**Suggested actions to improve rational use of antibiotics and other medications**

Strengthening rational use of antibiotics (including correct indication and choice of antibiotics) and raising community awareness of the ineffectiveness of antibiotics for viral infections are crucial to ensuring better use of antibiotics. The assessment team proposes the following steps as the basis for policy change and implementation of actions towards rational use of antibiotics and other medications.
• The Ministry of Health and WHO to seek to understand and address prescribing behaviours; this could include conducting a behavioural and cultural insights study building on already ongoing work.

• The Ministry of Health to consider the following actions to improve the rational use of antibiotics:
  o review existing regulations and adopting and enforcing new regulations to restrict access to antibiotics over the counter;
  o adopting and enforcing adequate regulations to control pharmaceutical industries’ access to health workers and to block their attempts to influence behaviour in prescribing antibiotics and other medications;
  o reviewing financing schemes that provide possible incentives for misuse of antibiotics;
  o ensuring that there is sound preservice training and ongoing medical education;
  o supporting and enabling health workers at all levels to adhere to treatment guidelines;
  o conducting an awareness-raising campaign on the harms of antibiotic misuse.

• Routine administration of trimebutine-based medicines to children with acute gastroenteritis should be stopped.

• Routine administration of ergometrine to women after delivery, when not indicated, should be stopped.

Suggested actions to improve maternal and perinatal care

• The Ministry of Health to consider adopting and implementing the Baby Friendly Initiative throughout the country.

• The Ministry of Health to involve midwifery in pre- and postnatal care of mothers and newborns (the role of midwifery should be explicit in the job description and reflected in midwifery training in the country).

• The Ministry of Health and WHO to consider extending the health systems evaluation of unnecessary hospitalizations to the medical records of newborns.

• The promotion of feeding formula to be regulated and the code of marketing of breast-milk substitutes to be implemented.

• A behavioural insights study to be conducted to understand the high rate of caesarean sections and the low rate of breastfeeding; a campaign to promote breastfeeding as optimal, with substantial health benefits for both newborn and mother, could be undertaken.

• The high proportion of caesarean sections to be addressed: implement the Robson Classification, address financial incentives that encourage caesarean sections, provide information on the potential adverse effects for pregnant women, including hypogalactia.
• The Ministry of Health and National Health Insurance House to endorse midwives as the main service provider for prenatal education and for assisting low-risk deliveries.

• High adolescent pregnancy rates were noted during the assessment. It is therefore suggested that access to contraception, including emergency contraception, and medical abortion without parental consent (based on maturity) be improved; comprehensive sex education be provided in schools; and services for adolescent sexual and reproductive health be included in the reform of family planning practices. A twinning with the comprehensive sexual and reproductive health services for young people in the Republic of Moldova is proposed with a view to implementing a similar approach in Romania.
1. Rationale and background

Observations from completed WHO missions in countries of the WHO European Region show that paediatric patients with conditions such as upper respiratory virus infections, pneumonia or diarrhoea are often admitted to hospital for treatment; these observations are supported by the available data (1). Such conditions, however, can often be managed in primary health care (PHC) rather than in an inpatient context. Hospitalization of children and adolescents can lead to unnecessary psychological, emotional and physical disturbances, and extensive hospitalization stays can negatively impact the development of toddlers (2–5). Hospitalizations can also lead to increased familial stress, disruption of education due to missed school days, an increased risk of nosocomial infections, and a considerably larger financial burden incurred both by patients and by health facilities (6). Similarly, hospitalization of pregnant women can lead to unnecessary psychological, emotional and physical impacts (7–9). In addition, even when hospital care is justified, patients should be hospitalized only for the time that is strictly required, as unnecessarily prolonged hospitalization may contribute to the negative impacts mentioned above. As such, timely discharge is a recognized criterion used to assess quality of care in hospitalized children (10).

Hospitalization is considered unnecessary when the disease or condition could have been managed safely and entirely in a PHC setting. Unnecessary hospitalization should be distinguished from potentially avoidable hospitalization; the latter is hospitalization that might be avoided by government policies ensuring that adequate socioeconomic resources and access to high-quality housing and to timely, appropriate and affordable PHC are available, and that relevant promotion strategies are implemented (11).

Obtaining data on unnecessary hospitalizations of children and pregnant women, and on timely discharge of women hospitalized for delivery and of their newborn babies, could help to significantly enhance our understanding of current barriers to PHC access and utilization, to identify socioeconomic factors that influence health-care-seeking behaviours, and to improve appropriate delivery and use of health services.

In addition, observations from completed WHO missions in different settings suggest that treatment of common childhood conditions often comprises use of multiple unnecessary and invasive drugs, which is not evidence-based and not in line with international guidelines (12). Fears associated with the COVID-19 pandemic may have exacerbated such practices, leading to overuse of antibiotics for viral infections. Misuse of antibiotics is of particular concern because it risks not only causing direct harm to patients but also accelerating antimicrobial resistance, which is a global public health challenge. At the same time, it is commonly understood that patients and caregivers do not feel that they have been properly taken care of unless medication is prescribed by their doctor. Such a perception is likely to exacerbate prescription of unnecessary drugs. Assessing prescription of antimicrobials and other drugs for common conditions in hospitalized children and pregnant women, as well as analysing the context in which they are prescribed, should help use to gauge the
scale of the problem. This, in turn, will allow us to develop and implement targeted solutions that improve prescription of antibiotics and drugs following evidence-based international guidelines and that contribute to strengthening PHC overall.

The health systems evaluation in Romania was managed by the WHO Regional Office for Europe and the WHO Country Office in Romania, in collaboration with the Ministry of Health of Romania. It was partly funded by the Bill and Melinda Gates Foundation in the context of mitigating the indirect impact of COVID-19 on maternal and child health services.

1.1 Purpose of the evaluation
This health assessment evaluation was carried out in Romania with the aim of:

- determining hospitalization rates in children and pregnant women since 2011;
- identifying the main causes of hospitalization in these population groups;
- quantifying and understanding the reasons for unnecessary and unnecessarily prolonged hospitalizations in children, pregnant women and women hospitalized for delivery; and
- quantifying antibiotic use and polypharmacy in hospitalized children and pregnant women.
2. Methodology

The health assessment evaluation was conducted through national and hospital data collection, as summarized in Fig. 1 and detailed below.

Fig. 1. Summary of national and hospital data collection

<table>
<thead>
<tr>
<th>Step</th>
<th>Data to be collected</th>
<th>Source for data collection</th>
</tr>
</thead>
</table>
| National data collection    | • National hospitalization rates per year in children < 18 years and pregnant women between 2011 and 2021  
                                • Top primary diagnoses in hospitalized children < 18 years and pregnant women between 2011 and 2020 | National School of Public Health and Management, Ministry of Health of Romania |
| Hospital data collection    | • Number of hospitalized children < 18 years and pregnant women in 2019, 2020 and 2021 (yearly and monthly)  
                                • Top primary diagnoses in hospitalized children < 18 years and pregnant women  
                                • Among hospitalized children 2–59 months, pregnant women and women hospitalized for delivery:  
                                  • baseline characteristics  
                                  • evaluation of unnecessary and unnecessarily prolonged hospitalizations against standard of care  
                                  • antibiotics and other drugs received prior to and during hospitalization | Medical records (2019, 2020)                                                                 |
|                              | Doctors’ perspectives and rationales for hospitalization                                | Interviews                                                                 |

2.1 National data collection

National hospitalization rates per year from 2011 to 2021 for children under 18 years of age and pregnant women were requested and collected from the National School of Public Health and Management (NSPHM), operating under the Ministry of Health of Romania. The main causes of hospitalization over this period were collected for four groups: infants aged 0–11 months (i.e. under 1 year); children aged 12–59 months (i.e. 1–4 years); children aged 0–17 years; and pregnant women.

2.2 Hospital data collection

The health systems evaluation on unnecessary hospitalizations was conducted in December 2021 in 10 public hospitals throughout the country (Fig. 2). International and national WHO consultants were assigned to overall data collection and travelled to selected hospitals for quantitative data collection. In one hospital (Pitești), it was not possible to access full medical records, so it could not be included in the evaluation.
2.2.1 Hospitalizations and commonest diagnoses

The number of children and pregnant women hospitalized per month in 2019, 2020 and 2021 for each of the hospitals visited and information on the 10 commonest diagnoses were gathered from the NSPHM. This time period was chosen to be representative of the situation prior to the COVID-19 pandemic, at the start of the pandemic and until the end of 2021, so that the potential impact of the pandemic on these indicators could be assessed. In Romania a lockdown was imposed from 15 March to 15 May 2020, as a control measure at the start of the pandemic.

2.2.2 Inclusion criteria and evaluation of unnecessary and unnecessarily prolonged hospitalizations

Medical records were reviewed for:

- Children aged 2–59 months hospitalized with a primary diagnosis of acute respiratory infection or intestinal infection (diarrhoea). The focus was on children of this age group because they constitute the largest proportion of paediatric hospitalizations and because WHO standards of care are broadly adopted in Romania for hospital care of these children (13), allowing a straightforward assessment of care against these standards.

- Pregnant women up to 37 weeks of gestation hospitalized with a primary diagnosis of premature labour (threatened or incipient), threatened miscarriage, premature rupture of membranes or pre-eclampsia. In Romania threatened miscarriage is considered to occur up to 24 weeks of gestation (unlike 22 weeks in other settings and as per ICD-10 classification), so this was taken as the gestational age for such a diagnosis.

- Women with term pregnancy (from 37 weeks of gestation) hospitalized for delivery.
Detailed inclusion criteria with the relevant diagnoses and their corresponding ICD-10 coding are shown in Table 1 (14). These primary diagnoses for children and pregnant women were chosen as they were identified as the commonest causes of hospitalization for these population groups in previous assessments, such as the recent health systems evaluation conducted in Tajikistan (15), and in order to facilitate comparison between countries.

**Table 1. Inclusion criteria for evaluation of unnecessary hospitalizations**

<table>
<thead>
<tr>
<th>Population group</th>
<th>Inclusion criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>• Hospitalized (staying overnight following admission)</td>
</tr>
<tr>
<td></td>
<td>• 2–59 months of age</td>
</tr>
<tr>
<td></td>
<td>• Primary diagnosis of:</td>
</tr>
<tr>
<td></td>
<td>o upper respiratory tract infection (URTI) (ICD-10, J00–J06)</td>
</tr>
<tr>
<td></td>
<td>o pneumonia (J12–J18)</td>
</tr>
<tr>
<td></td>
<td>o acute bronchitis (J20)</td>
</tr>
<tr>
<td></td>
<td>o acute bronchiolitis (J21)</td>
</tr>
<tr>
<td></td>
<td>o other acute lower respiratory tract infection (LRTI) (J22)</td>
</tr>
<tr>
<td></td>
<td>o intestinal infection (diarrhoea) (A00–A09).</td>
</tr>
<tr>
<td>Pregnant women</td>
<td>• Hospitalized (staying overnight following admission)</td>
</tr>
<tr>
<td></td>
<td>• Confirmed pregnancy up to 37 gestation weeks</td>
</tr>
<tr>
<td></td>
<td>• Primary diagnosis of:</td>
</tr>
<tr>
<td></td>
<td>o premature labour up to 37 gestation weeks, including threatened and incipient</td>
</tr>
<tr>
<td></td>
<td>premature labour (O60)</td>
</tr>
<tr>
<td></td>
<td>o threatened miscarriage up to 24 gestation weeks (O20–O20.9)</td>
</tr>
<tr>
<td></td>
<td>o premature rupture of membranes (O42.2)</td>
</tr>
<tr>
<td></td>
<td>o mild to moderate pre-eclampsia (O14.0).</td>
</tr>
<tr>
<td>Women hospitalized for delivery</td>
<td>• Hospitalized (staying overnight following admission) for delivery</td>
</tr>
<tr>
<td></td>
<td>• Term pregnancy: from 37 gestation weeks</td>
</tr>
</tbody>
</table>

**Unnecessary hospitalization** was defined as hospitalization for a disease or condition that could have been entirely managed in a PHC setting and did not need hospitalization according to defined standards of care. Hospitalizations for women hospitalized for delivery were not assessed as unnecessary or not, as all deliveries in hospital are justified. For children and pregnant women, to determine whether hospitalization was necessary or not, clinical characteristics present at the time of admission for the primary condition leading to hospitalization (e.g. pneumonia, threatened premature labour) were reviewed from medical records and compared against defined standards of care (for standards for children, see Annex 1; for standards for pregnant women, see Annex 2). For each patient meeting the inclusion criteria, hospitalization was judged as:

- **necessary** if a clear criterion for hospitalization was found in the medical records (e.g. oxygen saturation of 84% in a child with a primary diagnosis of pneumonia, bleeding in a pregnant woman with threatened miscarriage);
• **unnecessary** if all the criteria for hospitalization were reported in the medical records and none of these accorded with the primary diagnoses set out in Table 1; or
• **unclear** if information was missing from the medical records so that a clear judgement that hospitalization was necessary or unnecessary could not be made.

**Unnecessarily prolonged hospitalization** was defined as hospitalization that lasted at least 24 hours longer than was strictly required – that is, when discharge criteria had been met for 24 hours or more before the patient was discharged from hospital. Clinical data on the evolution of the patient during hospitalization were reviewed from the medical records and compared against established discharge criteria (for discharge criteria for children, see Annex 1; for discharge criteria for pregnant women, see Annex 2). For each patient included, hospitalization was interpreted as:

• **not unnecessarily prolonged** when the patient was discharged on time;
• **unnecessarily prolonged** when the patient met all discharge criteria for at least 24 hours prior to discharge and no new hospitalization criteria were presented; or
• **unclear** if information was missing from the medical records so that a clear judgement that hospitalization was unnecessarily prolonged or not could not be made.

Hospitalizations that were judged to be unnecessary were automatically considered to be unnecessarily prolonged. At the time of the deliveries recorded in the medical records reviewed (2019 and 2020), the Romanian Society of Obstetrics and Gynaecology, with the approval of the Ministry of Health of Romania, recommended that women and their babies be discharged from hospital 48 hours after vaginal delivery and 72 hours after caesarean section. Based on these criteria, **unnecessarily prolonged hospitalization for women hospitalized for delivery** was defined as hospitalization that lasted 48 hours or more (in the case of vaginal delivery) or 72 hours or more (in the case of caesarean section); a few hours extra were allowed when delivery occurred at night, as it would not be expected that a woman would be discharged at that time. Maternal medical records were reviewed for any maternal, neonatal or social condition that could have justified a longer stay. If such a condition was identified, hospitalization was classified as **prolonged with reason**.

### 2.2.3 Participant selection and data collection

In each hospital, 40 paediatric medical records, 40 medical records of pregnant women, and 40 medical records of women hospitalized for delivery were randomly selected. For each group, 20 files from 2019 and 20 from 2020 were selected, so that they would be representative of the situation before the COVID-19 pandemic and at the beginning of the pandemic. The evaluation team selected one out of every three medical records from the piles of medical records, or all consecutive medical records that matched the diagnoses of interest, depending on the way records were kept, until the agreed number of records was reached. The decision to review 40 medical records was based on feasibility and the experience of those previously conducting work of a similar kind (15).
For each selected patient, data were extracted from medical records and entered into an online form (one each for children and pregnant women) or directly into a digitalized spreadsheet (an Excel file) for women hospitalized for delivery. Data collected included:

- baseline characteristics such as date of birth, time of admission, gestational week, and primary and secondary diagnoses;
- antibiotics and other drugs received prior to and during hospitalization;
- presence or absence of each hospitalization criterion for the primary diagnosis (children: Annex 1; pregnant women: Annex 2); and
- the date when the patient met discharge criteria.

2.3 Data management and analysis
Quantitative data were analysed with Stata 16 (16) and presented in tables and graphs, which were produced in Microsoft Excel. Comparison of proportions was performed using the chi-square test.
3. Findings from the national data collection

3.1 Number of hospitalizations and hospitalization rates at national level

The number of hospitalizations and hospitalization rates per year in Romania were fairly stable between 2011 and 2019, with an average (across the whole population) of 4.25 million hospitalizations per year (Fig. 3) and 214 hospitalizations per 1000 population per year (Fig. 4). In 2020, coinciding with the first phase of the COVID-19 pandemic, these indicators dropped to 2.50 million hospitalizations and 130 hospitalizations per 1000 population per year, across all age groups, and there was no significant increase in 2021. There were 718,067 hospitalized children under 18 years of age in 2019, dropping to 426,113 in 2020 and remaining almost unchanged at 431,719 in 2021.

Fig. 3. Hospitalizations per year in Romania, 2011–2021, for (A) the whole population and (B) children, pregnant women and women hospitalized for delivery

Data source: NSPHM

Fig. 4. Hospitalization rate per 1000 population per year in Romania, 2011–2021, for (A) the whole population and (B) children and pregnant women

Data source: NSPHM

3.2 Number of hospitalizations in selected hospitals in 2019, 2020 and 2021

Overall, lower numbers of hospitalizations were reported in 2020 than in 2019 across all the selected hospitals with available data, with a drop in the number of hospitalizations from February 2020, coinciding with the start of the COVID-19 pandemic. This trend was observed among children under 18 years (Fig. 5) and children aged 12–59 months (Annex 3). In 2021 the number of hospitalizations in children (Fig. 5; Annex 3) was mainly higher than in 2020, but lower than before the pandemic (2019), except in one hospital (Constanța). These trends were not observed in pregnant women (Fig. 6) or infants aged 0–11 months (Annex 3), for which the number of hospitalizations remained broadly
similar between 2019 and 2021. In pregnant women, the number of hospitalizations included women hospitalized for delivery, and in infants, the number of hospitalizations included newborns at birth for routine care.

Fig. 5. Hospitalization of children under 18 years of age in selected hospitals, 2019–2021

Fig. 6. Hospitalization of pregnant women in selected hospitals, 2019–2021

Data source: NSPHM
In Constanța the number of hospitalizations for children and pregnant women was higher in 2021 than in 2019 and 2020. In Focșani the number of hospitalizations for infants was, remarkably, lower in 2021 than in 2019 or 2020. In both cases, these abrupt changes in hospitalization data between 2020 and 2021 are currently being evaluated; they may be due to factors related to the particular hospital, such as additional beds or closure of a neonatal unit, or to errors in the data collection for these indicators.

3.3 Commonest diagnoses in hospitalized children

Acute respiratory infections comprising interstitial lung disease (ICD-10 code J84.9), pneumonia (J18.9) and acute bronchiolitis (J21.9), acute gastroenteritis (diarrhoea and gastroenteritis, probably infectious, A09), acute tonsillitis (J03.9) and neonatal jaundice (P59.9) were invariably among the 10 commonest diagnoses in hospitalized children every year between 2011 and 2020. Other common diagnoses among hospitalized children in the country included acute appendicitis (K35.9), bacterial infection (A49.9) and malnutrition (E44.1).

We looked at the commonest 10 diagnoses in each age group between 2011 and 2020. Fig. 7 shows the trends in the number of hospitalizations during this period due to acute respiratory infections and diarrhoea. For LRTIs, we grouped together the diagnoses reported as interstitial lung disease, pneumonia, viral pneumonia, other bacterial pneumonia and acute bronchiolitis; and for intestinal infections, we grouped together the diagnoses reported as diarrhoea, acute gastroenteritis and enteritis by rotavirus. It should be remembered that these numbers include hospitalizations only if they were due to the commonest 10 diagnoses. Among children under 18 years of age, the number of URTIs dropped between 2011 and 2020, and a drop in all diagnoses was observed in 2020 compared to previous years. In children aged 12–59 months, the number of hospitalizations due to LRTIs decreased progressively over the period.

**Fig. 7. Hospitalizations due to acute respiratory infections and intestinal infections (diarrhoea), 2011–2020, in (A) children under 18 years of age and (B) children aged 12–59 months**

*Data source: NSPHM*

In infants aged 0–11 months, liveborn infants (ICD-10 Z38) and conditions originating in the perinatal period (P00–P96) were the commonest diagnoses reported. Fig. 8 shows the trends in the number of hospitalizations due to diseases that appear among the 10 commonest diagnoses, which
include neonatal jaundice, pulmonary disease and acute bronchiolitis. While the number of infants hospitalized with neonatal jaundice increased, diagnoses of pulmonary disease (J84.9) and acute bronchiolitis were no longer among the 10 commonest diagnoses in 2020.

**Fig. 8. Hospitalizations due to the commonest diagnoses in infants aged 0–11 months, 2011–2020**

![Hospitalizations chart]

*Data source: NSPHM*

3.4 Commonest diagnoses in pregnant women

Not surprisingly, diagnoses related to delivery were the commonest in pregnant women. A striking finding, however, is that delivery by caesarean section was more common than vaginal delivery between 2015 and 2020 (Fig. 9). While the overall number of deliveries decreased after 2016, the difference between caesarean sections and vaginal deliveries remained stable.

**Fig. 9. Hospitalizations related to delivery, by vaginal delivery or caesarean section, 2011–2020**

![Hospitalizations chart]

*Data source: NSPHM*
In addition to hospitalizations related to deliveries, threatened abortion (O20), threatened premature labour (i.e. false labour before 37 completed weeks of gestation, O47.0), maternal care due to uterine scar from previous surgery (O34.2), and delayed or excessive haemorrhage following abortion and ectopic and molar pregnancy (O08.1) were among the top 10 diagnoses every year between 2011 and 2020 (Fig. 10). Other common obstetric diagnoses during this period were spontaneous abortion: incomplete, complicated by delayed or excessive haemorrhage (O03.1); false labour at or after 37 completed weeks of gestation (O47.1); retained portions of placenta and membranes, without haemorrhage (O73.1); and postpartum haemorrhage (third-stage haemorrhage, O72.0).

**Fig. 10. Proportion of hospitalizations due to the commonest obstetric diagnoses, 2011–2020**

*Data source: NSPHM*
4. Findings from the review of medical records

Overall, 209 records were reviewed for children, 349 for pregnant women, and 240 for women hospitalized for delivery.

4.1 Basal characteristics

4.1.1 Children

A total of 209 medical records of children hospitalized between January 2019 and December 2020, randomly selected from seven hospitals, met our inclusion criteria and were included in the analyses. The average age of the children was 19.8 months (median 16 months, interquartile range (IQR) 7–28). Over a third were infants aged 2–11 months (38.8%); the remainder were aged 12–59 months (61.2%). Most children were brought to hospital by their parents or caregivers, but 30 children (14.3%) were referred from PHC or other hospitals. Overall, 25.8% of the children (54/209) were admitted at night (22:00–06:00). In the case of six hospitals, at least 22.9% of the children (39/170) were brought to hospital by ambulance, at the request of their parents or caregivers.

Around two thirds of children (61.2%) were hospitalized with a primary diagnosis of a respiratory infection, including pneumonia (20.1%), URTI (17.2%), croup (5.7%), acute bronchiolitis (11.5%), acute bronchitis (4.3%) and unspecified LRTI (2.4%). The remaining children (38.8%) were hospitalized with a primary diagnosis of acute gastroenteritis, with no case of dysentery. Because of the small number of children in some of the above categories, we formed two groups by merging diagnoses of acute bronchiolitis, acute bronchitis and unspecified LRTIs (J20–J22) and diagnoses of croup and URTIs (J00–J06). Four groups of primary diagnoses were thus considered for further analysis (Fig. 11).

Fig. 11. Proportion of children with each of the main primary diagnoses

Other diagnoses that were commonly present in children at time of admission or during hospitalization are shown in Fig. 12. The commonest condition was anaemia, reported in 27.8% of children, while iron deficiency was reported in a further 3.8% of children.
Reporting of secondary diagnoses differed from hospital to hospital. For example, 26 children were diagnosed with metabolic acidosis at two hospitals, but there were no children with this diagnosis at the other hospitals. Similarly, 13 children were diagnosed with oral or digestive candidiasis at two hospitals, and seven children with suspected COVID-19 at three hospitals.

Oxygen saturation at admission was recorded in the medical records of 37.5% (48/128) of children admitted with a primary diagnosis of a respiratory condition. Among these, four children presented with an oxygen saturation under 90% in room air, and another child had such a measurement while already receiving oxygen. Overall, 8.6% of children (18/209) received oxygen therapy during hospitalization.

4.1.2 Pregnant women

A total of 349 medical records of pregnant women hospitalized between January 2019 and December 2020, randomly selected from nine hospitals, met our inclusion criteria and were included in the analyses.

The median age of the pregnant women was 28 years (IQR 22–33), and 16.6% of them (58/349) were teenagers. While most women came to hospital of their own accord (without referral), 6.0% (21/349) were referred by their family doctor (17) or another hospital (four). Overall, 20.6% of the women (72/349) were admitted at night (22:00–06:00).

Just over half of the pregnant women (53.3%) were hospitalized with threatened premature labour as the primary diagnosis recorded at admission. The remainder were hospitalized with a primary diagnosis of threatened miscarriage (44.4%), mild to moderate pre-eclampsia (1.7%) or premature rupture of membranes (0.6%) (Fig. 13).
Of other diagnoses reported in pregnant women during hospitalization, the most common were anaemia (20.6%), urinary tract infection (7.7%), hypertension (2.6%), renal colic (1.7%) and gestational diabetes (1.4%) (Fig. 14).

**Fig. 13. Proportion of pregnant women with each of the selected primary diagnoses**

**Fig. 14. Proportion of pregnant women with other common diagnoses reported during hospitalization**

### 4.1.3 Women hospitalized for delivery

A total of 240 medical records of women hospitalized for delivery between January 2019 and December 2020 in nine hospitals met our inclusion criteria and were included in the analyses.

The median age of these women was 28 years (IQR 22–33), and 15.0% of them (36/240) were teenagers. While 68.3% (164/240) of the women had had the recommended number of antenatal care visits, 11.7% (28/240) had only had a few such visits, and 14.2% (34/240) had had no visits at all. Overall, 26.7% (64/240) were admitted at night (22:00–06:00) and 21.7% (52/240) gave birth at night.

Less than half the women (47.1%) had a vaginal delivery, while the remaining 52.9% had a caesarean section. The proportion of caesarean sections varied between hospitals, ranging from 30.0% to 68.6% (Fig. 15). In three hospitals, medical records for vaginal deliveries and caesarean sections were kept separately; records were selected in proportion to the size of the piles for the relevant months, but the number of caesarean sections in the selected records may not accurately reflect the proportion of caesarean sections actually performed in the hospital concerned. The proportion of caesarean sections performed at night was 17.3%; during the day, 62.6%.
Of other diagnoses reported during hospitalization in women hospitalized for delivery, the most common were anaemia (45.8%), hypogalactia (44.2%), gestational diabetes (9.6%), postpartum haemorrhage (8.8%) and perineal laceration (8.3%) (Fig. 16).

4.2 Unnecessary hospitalizations

Across all the hospitals visited, 57.9% (121/209) of children’s hospitalizations and 56.2% (196/349) of pregnant women’s hospitalizations were judged unnecessary. There was a low proportion of medical records (1.9% in children, none in pregnant women) in which it was unclear whether
hospitalization was necessary or not as a result of missing information. This low proportion of unclear cases reflects good data-reporting in the medical records throughout the hospitals visited.

4.2.1 By diagnosis

The proportion of unnecessary hospitalizations in children was similar across the different diagnoses, ranging from 54.3% to 68.3% (Fig. 17).

**Fig. 17. Proportion of unnecessary hospitalizations in children, by primary diagnosis**

For children presenting with wheeze, the *Pocket book of hospital care for children* (13) recommends administration of a rapid-acting bronchodilator and reassessment of the child’s condition after 15 minutes; hospitalization is indicated for children who still have signs of severe pneumonia (oxygen saturation < 90% or central cyanosis, severe respiratory distress, unable to drink due to respiratory distress) or fast breathing. However, in some of the hospitals visited in Romania, we were told that children with signs of severe pneumonia or fast breathing who required a rapid-acting bronchodilator were usually directly hospitalized, as it was assumed that such children could not be managed at home and monitored by PHC physicians, irrespective of their immediate response to bronchodilators. There was therefore a missed opportunity to identify children with wheeze who responded well to a rapid-acting bronchodilator and could be managed at home, thereby avoiding potentially unnecessary hospitalizations.

Fever was the main reason given for hospitalizations that were judged to be unnecessary. Other common reasons given for unnecessary hospitalization were a child’s condition not improving after a few days at home and the family’s wish to have their child hospitalized. In addition, 14 children who were hospitalized unnecessarily were from families that may have faced social challenges such as low income or the mother’s young age. However, hospitalization never seemed to be justified by such social circumstances and could have been avoided if adequate PHC and social services were in place.

In pregnant women, the proportion of unnecessary hospitalizations varied enormously across different primary diagnoses (Fig. 18). Hospitalizations of almost all pregnant women with threatened premature labour (96.2%; 179/186) and all six women with mild to moderate pre-
eclampsia were unnecessary. By contrast, hospitalizations of most women with threatened miscarriage (92.9%; 144/155) and of the two women with premature rupture of membranes were necessary.

**Fig. 18. Proportion of unnecessary hospitalizations in pregnant women, by primary diagnosis**

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Proportion</th>
</tr>
</thead>
<tbody>
<tr>
<td>All diagnoses</td>
<td>56.2%</td>
</tr>
<tr>
<td>Threatened premature labour</td>
<td>96.2%</td>
</tr>
<tr>
<td>Threatened miscarriage</td>
<td>7.1%</td>
</tr>
<tr>
<td>Mild to moderate pre-eclampsia</td>
<td>100%</td>
</tr>
<tr>
<td>Premature rupture of membranes</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

*The total number of women used to calculate these proportions were: 349 for all diagnoses; 186 for threatened premature labour; 155 for threatened miscarriage; six for mild to moderate pre-eclampsia; and two for premature rupture of membranes.*

### 4.2.2 By age group, time of admission, referral and use of ambulance

In children, the proportion of unnecessary hospitalizations was similar across age groups (infants 2–11 months versus children 12–59 months) (56.3% versus 60.8%, \( p = 0.518 \)) (Fig. 19). The proportions of unnecessary hospitalizations were also similar between children admitted during the day (06:00–22:00) and at night (22:00–06:00) (58.7% versus 61.1%, \( p = 0.754 \)) and between children who were or were not referred from another health centre (50.0% versus 62.4%, \( p = 0.202 \)). However, the proportion of unnecessary hospitalizations was higher among children who came to hospital by ambulance than among those who came by private means (78.4% versus 54.8%, \( p = 0.008 \)).
4.2.3 By hospital

The proportion of unnecessary hospitalizations in children ranged from 31.3% to 81.1% in the seven hospitals visited (Fig. 20).

Fig. 20. Proportion of unnecessary hospitalizations in children, by hospital*  

* The number attached to each hospital was randomly assigned to preserve the anonymity of the findings.

In the case of pregnant women, very little difference in practice was found between hospitals. The seven unnecessary hospitalizations of women with threatened premature labour occurred in five different hospitals, while the 11 necessary hospitalizations of women with threatened miscarriage occurred in four different hospitals.
4.3 Duration of hospitalization

Children were hospitalized for an average of 4.7 days (median 4, IQR 3–6) and pregnant women for an average of 2.8 days (median 2, IQR 1–3). The duration of hospitalization did not differ between necessary and unnecessary hospitalizations, for either children or pregnant women. Duration of hospitalization by primary diagnosis is shown for children in Fig. 21 and for pregnant women in Fig. 22; and by hospital for children in Fig. 23 and for pregnant women in Fig. 24. In one hospital (Hospital 7), duration of hospitalization was at the higher end of the range for both children and pregnant women. Otherwise, there were no major differences in the duration of hospitalization between the hospitals.

**Fig. 21. Duration of hospitalization in children, by primary diagnosis**

![Diagram showing duration of hospitalization for children by primary diagnosis.](image)

*a* The orange dot shows the median duration of hospitalization, in days, for each primary diagnosis; the horizontal black line shows the IQR of duration of hospitalization.

**Fig. 22. Duration of hospitalization in pregnant women, by primary diagnosis**

![Diagram showing duration of hospitalization for pregnant women by primary diagnosis.](image)

*a* The blue dot shows the median duration of hospitalization, in days, for each primary diagnosis; the horizontal black line shows the IQR of duration of hospitalization.

*b* Only two pregnant women presented with premature rupture of membranes.
Almost all children (97.1%; 203/209) were discharged and allowed to go home; five (2.4%) were transferred to another hospital; and one (0.5%) died. All women were discharged and allowed to go home, except one, who was transferred to another hospital.

4.4 Unnecessarily prolonged hospitalizations

4.4.1 Children and pregnant women

All unnecessary hospitalizations were judged to be unnecessarily prolonged. Of necessary hospitalizations, 44.4% (32/72) were unnecessarily prolonged in children, and 23.3% (34/146) in pregnant women. In the case of 12 children and seven pregnant women, there were not enough data in the medical records to judge whether hospitalization was unnecessarily prolonged.
In five cases of children with necessary hospitalization, discharge took place at the request of the parents; hospitalization would have been deemed unnecessarily prolonged in four of them if the parents had not requested that they be discharged. Similarly, in the case of six pregnant women, hospitalization would have been deemed unnecessarily prolonged if they had not requested their own discharge against medical advice.

In children, the highest proportion of unnecessarily prolonged hospitalizations was found among those hospitalized with pneumonia (71.4%; 5/7) (Fig. 25). However, these findings need to be interpreted with caution because of the small number of children in each category (5/7 for pneumonia, 7/13 for acute bronchitis/bronchiolitis, 14/34 for acute gastroenteritis, and 6/18 for URTIs). The proportion of unnecessarily prolonged hospitalizations was similar in infants (40.6%; 13/32) and older children (47.5%; 19/40) (p = 0.560).

**Fig. 25. Proportion of necessary hospitalizations that were unnecessarily prolonged in children, by primary diagnosis and by age group**

![Diagram showing the proportion of necessary hospitalizations that were unnecessarily prolonged in children, by primary diagnosis and by age group.]

In pregnant women, the proportion of unnecessarily prolonged hospitalizations was not higher among teenagers (15.0%; 3/20) than among nonteenagers (31/126; 24.6%) (p = 0.345).

**4.4.2 Women hospitalized for delivery**

The hospitalizations of 45.8% (110/240) of women hospitalized for delivery and their babies were unnecessarily prolonged after delivery, corresponding to 57.5% (65/113) of vaginal deliveries and 35.4% (45/127) of caesarean sections (Fig. 26). The hospitalization of two other women and their babies would also have been classified as unnecessarily prolonged if they had not requested discharge against medical advice. Another 13 women (5.4%) were classified as prolonged hospitalizations but with a condition justifying a longer stay: six due to a medical condition of the newborn (e.g. diaphragmatic hernia, neonatal infection or exchange transfusion), four due to a medical condition of the mother (e.g. uterine involution or hypertension), and three social cases...
(including the case of a 14-year-old mother). The proportion of unnecessarily prolonged hospitalizations varied widely across the nine hospitals.

**Fig. 26. Duration of hospitalization in women hospitalized for delivery, by hospital and type of delivery**

<table>
<thead>
<tr>
<th>Hospital</th>
<th>All deliveries</th>
<th>Vaginal</th>
<th>Caesarean section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital 1</td>
<td>45.8</td>
<td>35.4</td>
<td>57.5</td>
</tr>
<tr>
<td>Hospital 2</td>
<td>22.5</td>
<td>36.4</td>
<td>42.1</td>
</tr>
<tr>
<td>Hospital 3</td>
<td>4.8</td>
<td>42.1</td>
<td>52.4</td>
</tr>
<tr>
<td>Hospital 4</td>
<td>12.5</td>
<td>20.0</td>
<td>80.0</td>
</tr>
<tr>
<td>Hospital 5</td>
<td>0.0</td>
<td>0.0</td>
<td>85.7</td>
</tr>
<tr>
<td>Hospital 6</td>
<td>0.0</td>
<td>0.0</td>
<td>100</td>
</tr>
<tr>
<td>Hospital 7</td>
<td>0.0</td>
<td>0.0</td>
<td>87.2</td>
</tr>
<tr>
<td>Hospital 8</td>
<td>0.0</td>
<td>0.0</td>
<td>92.9</td>
</tr>
<tr>
<td>Hospital 9</td>
<td>0.0</td>
<td>0.0</td>
<td>84.0</td>
</tr>
</tbody>
</table>

*The number attached to each hospital was randomly assigned to preserve the anonymity of the findings.*

In unnecessarily prolonged hospitalizations, the average duration of hospitalization was 4.2 days (median 4, IQR 3–5) for women who had given birth vaginally, and 5.4 days (median 5, IQR 4–6) for women who had had caesarean sections.

**4.5 Effects of the COVID-19 pandemic on hospitalization practices**

The impact of the COVID-19 pandemic and the resulting lockdown (15 March–15 May 2020) on unnecessary hospitalizations (Fig. 27) and unnecessarily prolonged hospitalizations (Fig. 28) was considered. While a drop between the pre-pandemic period and the lockdown was expected, this was in fact seen only for unnecessarily prolonged hospitalizations in pregnant women, which fell from 27.6% (24/87) to 10.5% (2/19), and for unnecessary hospitalizations in children, which fell from 63.9% (69/108) to 52.2% (12/23); however, these differences were not statistically significant. The proportion of unnecessarily prolonged hospitalizations in women hospitalized for delivery did not vary during and after the lockdown.
Fig. 27. Proportion of unnecessary hospitalizations before, during and after the COVID-19 lockdown (15 March–15 May 2020), in (A) children and (B) pregnant women

Fig. 28. Proportion of unnecessarily prolonged hospitalizations before, during and after the COVID-19 lockdown (15 March–15 May 2020), in (A) children, (B) pregnant women, and (C) women hospitalized for delivery

4.6 Antibiotics and polypharmacy

4.6.1 Children receiving antibiotics prior to admission

Prior to admission, 19.1% (40/209) of children received at least one antibiotic for 1–7 days: 28.9% (11/38) of children with a URTI; 21.4% (9/42) with acute bronchitis or bronchiolitis; 18.8% (9/48) with pneumonia; and 14.8% (12/81) with acute gastroenteritis. Overall, four children received antibiotics at the hospital from which they were referred, and two received antibiotics from their family doctor before referral. Among those treated at home, amoxicillin-clavulanate, amoxicillin and cefaclor were the most commonly prescribed antibiotics (Fig. 29).
4.6.2 Children receiving antibiotics during hospitalization

Two thirds of children (66.0%, 138/209) received at least one antibiotic during hospitalization. Overall, 18.2% (38/209) of children received two antibiotics and 1.0% (2/209) received three antibiotics. The most commonly prescribed antibiotics were amoxicillin (received by 21.1% of children), cefuroxime (18.2%), ceftriaxone (16.7%) and gentamicin (13.4%) (Fig. 30).

Fig. 30. Proportion of children receiving antibiotics during hospitalization, by antibiotic
Almost all children (92.9%, 39/42) hospitalized with pneumonia received at least one antibiotic, which is in line with WHO recommendations (Fig. 31). However, more than half (53.1%, 43/81) of children with a primary diagnosis of acute gastroenteritis received antibiotics during hospitalization, despite no children being diagnosed with dysentery.

**Fig. 31. Proportion of children receiving antibiotics during hospitalization, by primary diagnosis**

![Proportion of children receiving antibiotics during hospitalization, by primary diagnosis](image)

4.6.3 Pregnant women receiving antibiotics during hospitalization

Overall, 30.1% (105/349) of pregnant women were prescribed antibiotics during hospitalization, mostly ampicillin, cefuroxime or amoxicillin-clavulanate (Fig. 32).

**Fig. 32. Proportion of pregnant women receiving antibiotics during hospitalization, by antibiotic**

![Proportion of pregnant women receiving antibiotics during hospitalization, by antibiotic](image)

Except from two women with premature rupture of membranes who both received antibiotics, use of antibiotics was highest among pregnant women with a primary diagnosis of threatened miscarriage (43.2%) (Fig. 33). Looking at secondary diagnoses that might have justified use of
antibiotics, we actually found that five women with a secondary diagnosis of urinary tract infection did not receive antibiotics.

**Fig. 33. Proportion of pregnant women receiving antibiotics during hospitalization, by primary diagnosis**

<table>
<thead>
<tr>
<th>Primary Diagnosis</th>
<th>Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threatened premature labour</td>
<td>18.8</td>
</tr>
<tr>
<td>Threatened miscarriage</td>
<td>43.2</td>
</tr>
<tr>
<td>Mild to moderate pre-eclampsia</td>
<td>16.7</td>
</tr>
<tr>
<td>Premature rupture of membranes</td>
<td>100</td>
</tr>
</tbody>
</table>

**Fig. 34 shows the variation in the proportion of pregnant women receiving antibiotics between the different hospitals.**

**Fig. 34. Proportion of pregnant women receiving antibiotics during hospitalization, by hospital**

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital 1</td>
<td>70.0</td>
</tr>
<tr>
<td>Hospital 2</td>
<td>6.3</td>
</tr>
<tr>
<td>Hospital 3</td>
<td>25.0</td>
</tr>
<tr>
<td>Hospital 4</td>
<td>11.8</td>
</tr>
<tr>
<td>Hospital 5</td>
<td>42.5</td>
</tr>
<tr>
<td>Hospital 6</td>
<td>56.4</td>
</tr>
<tr>
<td>Hospital 7</td>
<td>13.9</td>
</tr>
<tr>
<td>Hospital 8</td>
<td>15.4</td>
</tr>
<tr>
<td>Hospital 9</td>
<td>31.0</td>
</tr>
</tbody>
</table>

* The number attached to each hospital was randomly assigned to preserve the anonymity of the findings.

**4.6.4 Women hospitalized for delivery receiving antibiotics**

At least one antibiotic was prescribed to 65.4% (157/240) of women hospitalized for delivery. Almost all women (94.5%; 120/127) who gave birth by caesarean section received antibiotics. While national guidelines recommend one prophylactic dose of antibiotics intraoperation, 50.8% (61/120) of women received antibiotics for at least two days and 34.2% (41/120) received a three-day course of antibiotics. Of women giving birth vaginally, 32.7% (37/113) received at least one antibiotic: 29.7% (11/37) for one day; 13.5% (5/37) for two days; 27.0% (10/37) for three days; 24.3% (9/37) for longer; and 5.4% (2/37) for unknown duration.
Considering other (secondary) diagnoses (Fig. 16) that may justify antibiotic prescription, five women had urinary tract infections (one diagnosis was doubtful, and for another antibiotics were not given); and three other women were reported to be carriers of group B streptococcus (one received ampicillin for one day, the other two had no antibiotics). One woman was reported to have Strepтокoccus pyogenes infection as a secondary diagnosis and received two days of ampicillin. No other secondary diagnoses reported in the medical records were indications for antibiotic therapy.

4.6.5 Polypharmacy and unjustified prescriptions

4.6.5.1 Children
During their hospitalization, children received an average of four drugs (IQR 3–5), ranging from 0 to 12, in addition to the antibiotics described above, intravenous fluids and oxygen. Common drugs prescribed included antipyretic and analgesic drugs such as paracetamol, ibuprofen and metamizole, and short-acting bronchodilators. Overall, 53.1% (111/209) of children received corticosteroids. This includes 84.2% of children with acute bronchitis, acute bronchiolitis or unspecified LRTI, for which corticosteroids may be well indicated, and 50% of those with URTI, for which this kind of drug may be well indicated in case of croup. However, 83.3% of children with pneumonia and 24.7% of those with acute gastroenteritis also received corticosteroids, for which a justified evidence-based indication may be questionable. In addition, 10.5% received nebulized dexamethasone, the indication of which is doubtful.

Children were prescribed other medications when they were not indicated or with no evidence of benefits, such as probiotics (46.9% of children), diosmectite (Smecta) (54.3% of children with acute gastroenteritis), and mucolytics (15.6% of children with a primary diagnosis of a respiratory condition). It is also worth mentioning that two children were given promethazine or phenobarbital for prevention of febrile convulsion. Of children with acute gastroenteritis, 19.8% (16/81) received trimebutine-based medicines during hospitalization; 11 of these children were under two years of age, despite trimebutine-based medicines being contraindicated in this age group (17).

While 59.3% (124/209) of children received intravenous fluids during hospitalization, only three were prescribed oral rehydration solution. No children with acute gastroenteritis were prescribed zinc.

4.6.5.2 Pregnant women
Pregnant women received an average of three drugs (IQR 2–4) during hospitalization, ranging from 0 to 15, in addition to the antibiotics described above, intravenous fluids and oxygen. As in the case of children, pregnant women were also commonly prescribed medication (such as vitamins) when they were not indicated or there was no evidence of benefits.

4.6.5.3 Women hospitalized for delivery
Overall, 45.0% (108/240) of women received ergometrine after expulsion, corresponding to 61.1% (69/113) of women delivering vaginally and 30.7% (39/127) of those undergoing caesarean section. Ergometrine is indicated for contractions of the uterus to treat vaginal bleeding after delivery. While
8.8% (21/240) of women were reported to have postpartum haemorrhage (Fig. 16), the proportion of women receiving ergometrine seemed unjustifiably high. In addition, eight women (3.3%) also received ergometrine prior to expulsion, with unclear indication.

4.7 Perinatal care: observations

At the time of our visits, we observed several practices still in place that are not in line with current WHO and other international recommendations (18,19). In all hospitals, newborns were separated from their mothers just after birth, for at least 1–4 hours after vaginal delivery and at least 12–24 hours after caesarean section. Start of breastfeeding was almost invariably delayed, and overall there was a lack of breastfeeding support for mothers from health staff. It is shocking that nearly half of women (44.2%), as reported above, are diagnosed after delivery with hypogalactia (insufficient milk secretion to maintain exclusive breastfeeding). This is surely caused, in most cases, by a combination of delayed start of breastfeeding, lack of breastfeeding support, and separation of mothers and newborns during the first hours of life.

A woman’s partner or companion was not allowed to attend during delivery or during hospitalization until discharge of mother and baby. This was the case for all hospitals visited with one exception, where companions or partners were allowed if doctors gave permission. The current situation is no different from that prior to the pandemic, when one hospital allowed partners/companions to stay with the mother but other hospitals already had restrictions in place.

Finally, medicalization of noncomplicated delivery and care for healthy newborns was observed. Although we did not quantify the number of women who had “preventive episiotomy”, this diagnosis was seen in a number of the medical records we reviewed. In Romania, suction of mouth and nose at birth is currently routinely maintained, although this is no longer recommended in newborns who start breathing on their own (18).

5. Strengths and limitations

This health systems evaluation on unnecessary hospitalizations has some limitations. It is mainly based on quantitative data collected retrospectively from medical reports. Therefore, reasons for hospitalization other than strict clinical signs (inclusion criteria) and other relevant information not recorded in the medical charts may lead to an overestimation of unnecessary and unnecessarily prolonged hospitalizations. However, all children and pregnant women were classified as “unclear” if there were not sufficient data in their medical records to judge whether their hospitalization was necessary or unnecessary, thus limiting the extent to which unnecessary hospitalizations were overestimated. An average of 40 medical records were reviewed at each hospital for each group (children, pregnant women, women hospitalized for delivery), which provided consistency in the findings overall. However, findings need to be interpreted with caution when comparing data in subgroups in which the numbers are relatively small.
The strengths of this health systems evaluation are multiple. First, data were collected in 10 hospitals throughout Romania, making the findings applicable to the whole country. Second, the random selection of medical records and the transparent and systematic approach used for data collection mean that the evaluation can be reproduced by following the same methodology, thereby allowing data comparison and progress tracking. Third, the assessment focused on the commonest diagnoses in hospitalized children and pregnant women in Romania according to national data. Use of these findings to strengthen management of these common diagnoses in PHC is likely to have a considerable impact on the overall quality of care for children and pregnant women.

6. Summary of findings and the way forward

6.1 Suggested actions to reduce unnecessary hospitalizations and strengthen PHC

6.1.1 Summary of findings and context analysis

Unnecessary hospitalizations were common, accounting for 57.9% of hospitalizations in children and 56.2% in pregnant women. In the case of necessary hospitalizations, children and pregnant women were commonly kept in for too long when they could have been safely discharged. While high-quality education and training of doctors on referral and hospitalization criteria following accepted standards of care are clearly needed to limit unnecessary hospitalizations, other actions are also required.

Allocation of public resources to the health sector in Romania has improved since 2018. Prior to 2018, limited resources were reflected in the low salaries of health workers in the public sector and high out-of-pocket payments for health care. Nevertheless, in 2019 out-of-pocket payments were still above the European Union average and dominated by outpatient pharmaceutical costs (20). Although the level of resources has improved, the changes in behaviour and practice that are needed as well are slower to occur. Reliance on informal payments to supplement salaries, and salaries and workforce directly linked to hospital bed occupancy, are likely to lead to non-evidence-based treatment and prescribing practices and to unnecessary hospitalizations. This also partly explains the preference for caesarean section over vaginal delivery.

Many hospitalizations were unnecessarily prolonged. Some of these could be explained, at least partly, by time spent waiting for investigation results and for completion of antibiotic courses (although these were sometimes inadequate or could have been given orally to allow treatment to be completed at home). In the case of women hospitalized for delivery, unnecessarily prolonged hospitalizations could also be partly explained by a lack of trust on the part of health workers in a mother’s ability to care for her baby, combined with their own strong sense of responsibility. Observations also suggest that another reason why mothers’ hospitalizations were unnecessarily prolonged was that their newborn babies required administration of antibiotics, even though this was unjustified in many cases. More data are needed to confirm these observations, and changes need to be made accordingly.
The imbalance between PHC and inpatient care is still considerable in Romania. The proportion of health spending allocated to inpatient care in 2019 was the highest among European Union countries, at about 44% (20). In addition, the popular perception seems to be that hospital care is superior to that available at PHC level. This is bound to lower the threshold for admitting people to hospital, leading to an increase in unnecessary hospitalizations.

Misuse of ambulance services in the country seems to be significant. Ambulances are requested by patients at no cost to themselves, and the actual cost is covered by insurance companies. There are no medical criteria or other filters in place to prevent ambulances being used without authorization or justification. Therefore, although arrival at hospital by ambulance is not necessarily related to the severity of a patient’s condition, this fact may nevertheless influence health workers’ decisions about hospitalizing patients. Indeed, a higher proportion of unnecessary hospitalizations was found among children who came by ambulance.

Although not directly related to unnecessary hospitalization, there were other observations that should be considered and may need to be addressed if the quality of care for children and pregnant women is to be improved.

The random selection of medical folders suggested a low proportion of women with mild to moderate pre-eclampsia. This could be due to high detection of this condition and adequate management at PHC level of the women affected. However, data from previous work conducted by WHO in Romania cast doubt on this explanation: interviews with health-care providers revealed that pre-eclampsia was not frequently mentioned or identified as a complication during antenatal care visits (21). It is estimated that pre-eclampsia is present in 2–8% of all pregnancies (22), which suggests that the condition may be underdiagnosed or not fully recognized at either PHC or hospital level.

Finally, reporting of secondary diagnoses differed from one hospital to another. Children with metabolic acidosis or with oral or digestive candidiasis were reported at two hospitals, while the other hospitals did not report any children with such conditions. This is likely to reflect overdiagnosis of these conditions, leading to potentially unnecessary and harmful interventions such as laboratory testing and medication.

6.1.2 Way forward and next steps

Decreasing unnecessary hospitalizations will lead to substantial efficiency gains, in economic terms, both for families and for health systems, as well as to increasing patient safety. It is therefore proposed that:

- existing funding and financing mechanisms are reviewed for possible incentives that might encourage unnecessary hospitalization;
- capacity at PHC level is strengthened.
To this end, the following steps are proposed:

- The Ministry of Health to consider carrying out a root-cause analysis to gain a better understanding of the reasons for unnecessary hospitalization, with a focus on patient/parent and professional behaviour; this will involve:
  - key informant interviews with patients and caregivers to gain a better understanding of their perceptions of the quality of care provided at PHC facilities and hospitals and their reasons for seeking medical care;
  - key informant interviews with doctors to investigate the determinants of unnecessary hospitalization.

- The Ministry of Health and WHO to carry out further work to gain a better understanding of the root causes of unnecessary hospitalization and to engage in a participatory policy dialogue and apply system changes with the aim of strengthening PHC; this could include (among other things):
  - reviewing the differences in hospitalization rates alongside hospital bed occupancy rates;
  - strengthening PHC, including improving infrastructure, enhancing financing mechanisms and staff capacity-building, and promoting collaboration with social services (a finding of this study was that patients were admitted for social reasons, when medically not indicated, who could be better and more cheaply managed outside hospital if good PHC and social services were available);
  - strengthening care capacity at emergency departments and PHC (study findings included that children with wheeze who needed nebulization were admitted directly; many of these children could be sent home safely after short treatment in emergency departments if good PHC were available);
  - developing and implementing a plan to raise awareness of the harm caused by unnecessary hospitalization; and engaging in a participatory policy dialogue with the population to find ways to improve the health-care system and avoid unnecessary harm.

- The Ministry of Health and WHO to consider extending the health systems evaluation of unnecessary hospitalizations to medical records of newborns in order to understand the possible reasons for unnecessarily prolonged hospitalization of women hospitalized for delivery and to evaluate current practice in the management and hospitalization of newborns. Regulations on timely discharge of women hospitalized for delivery should be revised: when the mother can be safely discharged from a medical point of view, she should be discharged; and if her baby needs further hospital care, she should be readmitted as a caregiver.
• Consideration should be given to extending the assessment to other areas, such as noncommunicable diseases and infectious diseases (including tuberculosis).

• The Ministry of Health and WHO to work to achieve a successful implementation of the *Pocket book of primary health care for children and adolescents* (23) in order to strengthen management of childhood diseases at PHC level and thus reduce unnecessary hospitalizations.

• The Ministry of Health to consider regulating use of ambulances: implementing a triage system so that only patients who require emergency transport can access ambulance services; ensuring that frivolous use is penalized; and establishing a reimbursement system for use of taxis for low-income groups that cannot otherwise reach hospital.

• The Ministry of Health to review national data on pre-eclampsia detection. If the detection rate is low, an effective system of pre-eclampsia screening and management would be required.

• The Ministry of Health to investigate the detection of secondary diagnoses, such as metabolic acidosis and oral or digestive candidiasis, in hospitalized children, to avoid potential overdiagnosis of such conditions and hence unnecessary interventions.

### 6.2 Suggested actions to improve the rational use of antibiotics and other medications

#### 6.2.1 Summary of findings and context analysis

The assessment showed that the misuse of antibiotics was not negligible. The choice and indication of antibiotics were not in line with WHO and international recommendations in many cases, especially in the case of children hospitalized with acute gastroenteritis. Findings indicate that there is scope for improvement in the rational use of antibiotics. Unnecessary use of antibiotics is harmful to the individual child, mother and unborn baby, and also presents a threat to society through the development of antimicrobial resistance.

While antibiotics are clearly indicated in children hospitalized with severe pneumonia, most acute respiratory infections in young children, normally involving 2–3 days of fever, are caused by viruses. Persistence of fever, following (probably incorrect) prescription of an antibiotic at the first onset of a febrile condition, is therefore likely to be the normal course of a viral infection rather than a bacterial infection not responding to antibiotics.

The situation is even clearer in the case of children with diarrhoea. Except for dysentery (loose stools mixed with blood), antibiotics are not indicated for children with diarrhoea and can cause harm. However, in the assessment it was found that 53.1% of children hospitalized with diarrhoea received antibiotics, despite no children being diagnosed with dysentery.
In addition to overuse of antibiotics, children received an average of four drugs during hospitalization. Medications that were not indicated or for which there was no evidence of benefits, such as probiotics and mucolytics, were commonly prescribed. More worryingly, 19.8% of children with acute gastroenteritis received trimebutine-based medicines during hospitalization. Trimebutine is a spasmolytic agent with effect on opioid receptors. While it might be well indicated for patients with irritable bowel syndrome, there is no evidence suggesting that it has benefits for children with acute gastroenteritis (23,25). Moreover, adverse effects associated with trimebutine can be severe and trimebutine-based medicines are contraindicated in children under two years of age (17,26).

The proportion of women receiving ergometrine just after delivery seemed unjustifiably high.

6.2.2 Way forward and next steps

Strengthening rational use of antibiotics (including correct indication and choice of antibiotics) and raising community awareness of the ineffectiveness of antibiotics for viral infections are crucial to ensuring better use of antibiotics. The assessment team proposes the following steps as the basis for policy change and implementation of actions towards rational use of antibiotics and other medications.

- The Ministry of Health and WHO to seek to understand and address prescribing behaviours; this could include conducting a behavioural and cultural insights study building on already ongoing work.

- The Ministry of Health to consider the following actions to improve the rational use of antibiotics:
  - review existing regulations and adopting and enforcing new regulations to restrict access to antibiotics over the counter;
  - adopting and enforcing adequate regulations to control pharmaceutical industries’ access to health workers and to block their attempts to influence behaviour in prescribing antibiotics and other medications;
  - reviewing financing schemes that provide possible incentives for misuse of antibiotics;
  - ensuring that there is sound preservice training and ongoing medical education;
  - supporting and enabling health workers at all levels to adhere to treatment guidelines;
  - conducting an awareness-raising campaign on the harms of antibiotic misuse.

- Routine administration of trimebutine-based medicines to children with acute gastroenteritis should be stopped.

- Routine administration of ergometrine to women after delivery, when not indicated, should be stopped.
6.3 Suggested actions to improve maternal and perinatal care

6.3.1 Way forward and next steps

- The Ministry of Health to consider adopting and implementing the Baby Friendly Initiative throughout the country (27).
- The Ministry of Health to involve midwifery in pre- and postnatal care of mothers and newborns (the role of midwifery should be explicit in the job description and reflected in midwifery training in the country).
- The Ministry of Health and WHO to consider extending the health systems evaluation of unnecessary hospitalizations to the medical records of newborns.
- The promotion of feeding formula to be regulated and the code of marketing of breast-milk substitutes to be implemented (28).
- A behavioural insights study to be conducted to understand the high rate of caesarean sections and the low rate of breastfeeding; a campaign to promote breastfeeding as optimal, with substantial health benefits for both newborn and mother, could be undertaken.
- The high proportion of caesarean sections to be addressed: implement the Robson Classification (29), address financial incentives that encourage caesarean sections, provide information on the potential adverse effects for pregnant women, including hypogalactia.
- The Ministry of Health and National Health Insurance House to endorse midwives as the main service provider for prenatal education and for assisting low-risk deliveries.
- High adolescent pregnancy rates were noted during the assessment. It is therefore suggested that access to contraception, including emergency contraception, and medical abortion without parental consent (based on maturity) be improved; comprehensive sex education be provided in schools; and services for adolescent sexual and reproductive health be included in the reform of family planning practices. A twinning with the comprehensive sexual and reproductive health services for young people in the Republic of Moldova is proposed with a view to implementing a similar approach in Romania (30).
References


* All references were accessed on 28 July 2022.


Annex 1. Standards of care for assessment of unnecessary and unnecessarily prolonged hospitalizations in children

Hospitalization and discharge criteria were extracted for each of the commonest causes of hospitalization among children aged 2–59 months from the *WHO pocket book of hospital care for children* (13) (Table A1.1). This source was chosen as the reference for standard of care for children as it is widely used and has already been used in similar quality-of-care assessments (15).

Table A1.1. Hospitalization and discharge criteria for children aged 2–59 months

<table>
<thead>
<tr>
<th>Disease, condition (ICD-10 code)</th>
<th>Hospitalization criteria</th>
<th>Discharge criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FOR ALL</strong></td>
<td>The presentation of any <strong>general danger sign</strong> entails a hospitalization criterion by itself:</td>
<td>A decision on when to discharge should be made on an individual basis, taking into consideration factors such as:</td>
</tr>
<tr>
<td></td>
<td>• inability to drink or breastfeed</td>
<td>• the family’s home circumstances and how much support is available to care for the child</td>
</tr>
<tr>
<td></td>
<td>• vomiting everything</td>
<td>• staff’s judgement of the likelihood that the treatment course will be completed at home or that the family will return immediately to hospital if the child’s condition worsens.</td>
</tr>
<tr>
<td></td>
<td>• history of convulsions during current illness</td>
<td></td>
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<tr>
<td></td>
<td>• lethargy, unconsciousness or convulsions.</td>
<td></td>
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<tr>
<td><strong>URTI (including common cold and croup)</strong> (J00–J06)</td>
<td>Severe pneumonia (see next section) Severe croup, defined by any of the following:</td>
<td>• Respiratory distress resolved</td>
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<tr>
<td></td>
<td>• stridor even when the child is at rest</td>
<td>• No hypoxaemia (oxygen saturation &gt; 90%) in room air</td>
</tr>
<tr>
<td></td>
<td>• rapid breathing and low chest indrawing</td>
<td>• No apnoea</td>
</tr>
<tr>
<td>Pneumonia (J12–J18)</td>
<td>• oxygen saturation &lt; 90% or central cyanosis</td>
<td>• No stridor</td>
</tr>
<tr>
<td></td>
<td>Severe pneumonia, defined by any of the following:</td>
<td>• Alert</td>
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<tr>
<td></td>
<td>• oxygen saturation &lt; 90% or central cyanosis</td>
<td>• Afebrile</td>
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<tr>
<td></td>
<td>• severe respiratory distress (grunting, very severe chest indrawing)</td>
<td>• No severe dehydration</td>
</tr>
<tr>
<td></td>
<td>Pneumonia not improving after three days (of oral antibiotics)</td>
<td>• Feeding/eating well</td>
</tr>
<tr>
<td><strong>Acute bronchitis</strong> (J20), <strong>acute bronchiolitis</strong> (J21), <strong>unspecified acute LRTI</strong> (J22)</td>
<td>• Oxygen saturation &lt; 90% or central cyanosis</td>
<td>• Not vomiting everything</td>
</tr>
<tr>
<td></td>
<td>• Apnoea or history of apnoea</td>
<td>• Able to take oral medication (if needed)</td>
</tr>
<tr>
<td></td>
<td>• Gasping and grunting (especially in young infants)</td>
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<td></td>
<td>• Not improving after 15 minutes of rapid-acting bronchodilator (e.g. salbutamol)</td>
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<td></td>
<td>- Signs of severe pneumonia (see above)</td>
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<tr>
<td></td>
<td>- Fast breathing: ≥ 50 breaths/minute in 2–11 months; ≥ 40 breaths/minute in 12–59 months</td>
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<tr>
<td><strong>Diarrhoea, acute gastroenteritis, intestinal infectious diseases</strong> (A00–A09)</td>
<td>Severe dehydration, defined as two or more of the following signs:</td>
<td>• No severe dehydration</td>
</tr>
<tr>
<td></td>
<td>• lethargy or unconsciousness</td>
<td>• Feeding/eating well</td>
</tr>
<tr>
<td></td>
<td>• sunken eyes</td>
<td>• Not vomiting everything</td>
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<tr>
<td></td>
<td>• unable to drink or drinks poorly</td>
<td>• Alert</td>
</tr>
<tr>
<td></td>
<td>• skin pinch goes back very slowly (≥ 2 seconds) or “reduced turgor”</td>
<td>• Afebrile</td>
</tr>
<tr>
<td>Severe persistent diarrhoea, defined as:</td>
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<td>• diarrhoea lasting ≥ 14 days</td>
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<tr>
<td>• with signs of dehydration: see severe dehydration signs above, or two or more of the following signs:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) restlessness, irritability; (ii) sunken eyes; (iii) drinks eagerly, thirsty; (iv) skin pinch goes back slowly.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Dysentery (frequent loose stools mixed with blood) if any of the following criteria:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• &lt; 2 months old</td>
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<tr>
<td>• severely ill children, who look lethargic, have abdominal distension and tenderness or convulsions</td>
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</tr>
</tbody>
</table>
Annex 2. Standards of care for assessment of unnecessary and unnecessarily prolonged hospitalizations in pregnant women

There is no WHO document providing clear hospitalization and discharge criteria for pregnant women implemented in Romania that could be used as reference for standard of care. We therefore used national protocols, developed by the Romanian Society of Obstetrics and Gynaecology and approved by the Ministry of Health of Romania, that are widely used in the country (Table A2.1).

Table A2.1. Hospitalization and discharge criteria for pregnant women

<table>
<thead>
<tr>
<th>Disease, condition (ICD-10 code)</th>
<th>ICD-10 code</th>
<th>Hospitalization criteria</th>
<th>Discharge criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threatened premature labour up to 37 gestation weeks (O60)</td>
<td></td>
<td>Regular contractions of the uterus lasting at least 30 seconds, three or more in 30 minutes, WITH at least one of the following: • rupture of foetal membranes • dilation of the cervix up to 4 cm • effacement of the cervix ≥ 80%</td>
<td>• No labour or contractions in 48 hours • Full course of respiratory distress syndrome prevention, received for at least 48 hours</td>
</tr>
<tr>
<td>Threatened miscarriage up to 24 gestation weeks (O20-O20.9)</td>
<td></td>
<td>ANY of the following: • bloody discharge or bleeding • partial expulsion of products of conception • cramping pains in the lower abdomen • structural changes of the cervix (the cervix skips the finger)</td>
<td>• No bleeding in 24 hours</td>
</tr>
<tr>
<td>Premature rupture of membranes (between 24 and 37 gestation weeks) (O42.2)</td>
<td></td>
<td>ANY of the following: • pooling of fluid in the posterior vaginal fornix or clear fluid passing from the cervical canal • presence of fluid on the control pad within one hour • basic pH test of vaginal fluid</td>
<td>• Ultrasound test (amniotic fluid normal) • Lack of amniotic fluid on control pad in 24 hours</td>
</tr>
<tr>
<td>Mild to moderate pre-eclampsia (O14.0)</td>
<td></td>
<td>• Systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg, measured twice at an interval of at least four hours, occurring for the first time during pregnancy, after the gestational age of 20 weeks of amenorrhea, in a previously normotensive patient AND • Protein in urine ≥ 0.3 g/24 hours or urinary albumin/creatinine ratio ≥ 0.3 or dipstick 1+ (if other methods are not available)</td>
<td>• Blood pressure below 130/80 mmHg for two days • Decreased urine protein &lt; 0.2 g/24 hours or ratio &lt; 0.2 g/L • Gestation weeks ≤ 37</td>
</tr>
</tbody>
</table>
Annex 3. Hospitalizations of infants and young children in selected hospitals, 2019–2021

Fig. A3.1. Hospitalization of infants aged 0–11 months (left) and children aged 12–59 months (right) in selected hospitals, 2019–2021

Data source: NSPHM
The WHO Regional Office for Europe

The World Health Organization (WHO) is a specialized agency of the United Nations created in 1948 with the primary responsibility for international health matters and public health. The WHO Regional Office for Europe is one of six regional offices throughout the world, each with its own programme geared to the particular health conditions of the countries it serves.

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