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Disparities in the delivery of pediatric oncology nursing care by country income classification: International survey results

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Abstract

Background: In 2014, a task force of the International Society of Paediatric Oncology (SIOP) Paediatric Oncology in Developing Countries Nursing Workgroup published six baseline standards to provide a framework for pediatric oncology nursing care in low- and lower-middle income countries (L/LMIC). We conducted an international survey in 2016–2017 to examine the association between country income level and nurses' resporting of conformity to the standards at their respective institutions.

Procedure: Data from a cross-sectional web-based survey completed by nurses representing 54 countries were analyzed (N = 101). Responses were clustered by relevance to each standard and compared according to the 2017 World Bank–defined country income classification (CIC) of hospitals.

Results: CIC and nurse-to-patient ratios in inpatient wards were strongly associated ($P < 0.0001$). Nurses in L/LMIC prepared chemotherapy more often ($P < 0.0001$) yet were less likely to have access to personal protective equipment such as nitrile gloves ($P = 0.0007$) and fluid-resistant gowns ($P = 0.011$) than nurses in high-resource settings. Nurses in L/LMIC were excluded more often from physician/caregiver meetings to discuss treatment options ($P = 0.04$) and at the time of diagnosis ($P = 0.002$). Key educational topics were missing from nursing orientation programs across all CICs. An association between CIC and the availability of written policies ($P = 0.009$) was found.

Conclusions: CIC and the ability to conform to pediatric oncology baseline nursing standards were significantly associated in numerous elements of the baseline standards, a likely contributor to suboptimal patient outcomes in L/LMIC. To achieve the goal of high-quality cancer care for children worldwide, nursing disparities must be addressed.

KEYWORDS
disparities, global, low- and middle-income countries, nursing, pediatric oncology

1 | INTRODUCTION

A robust body of scientific evidence linking nursing care and patient outcomes has emerged over the past two decades. Factors such as nurses' workload, educational preparation, and work environments are associated with a decrease in mortality, infection rates, and cost of care in hospitalized patients.[1–5] Although studies specific to the pediatric population are limited, evidence indicates that nursing resources vary significantly across institutions caring for children and that inadequate nursing resources in pediatric wards are associated with surveillance left undone and missed changes in patients' condition.[6]

Approximately 300 000 children aged 0–19 are diagnosed with cancer per year.[7] The vast majority of those children live in countries with limited resources, which account for more than 90% of childhood cancer deaths.[8] The burden of treatment abandonment, defined

Abbreviations: BMT, bone marrow transplant; CIC, country income classification; HIC, high-income countries; IV, intravenous; LIC, low-income countries; LMIC, lower-middle income countries; L/LMIC, low- and lower-middle income countries; PICU, pediatric intensive care unit; PODC, Paediatric Oncology in Developing Countries; UMIC, upper-middle income countries; WHO, World Health Organization as failure to start or complete curative treatment,[9] falls heavily on lower-middle income countries (LMIC). An international survey by Friedrich et al suggests that 83% of new childhood cancer cases and 99% of treatment abandonment were attributable to LMIC.[10]

In 2012, the International Society of Paediatric Oncology (SIOP) Paediatric Oncology in Developing Countries (PODC) Nursing Working Group convened a workshop to address pediatric oncology nursing needs, with nurse representatives from low-, middle-, and high-income countries (LIC, LMIC, and HIC, respectively). A cross-sectional sample of LMIC nurses caring for children with cancer was surveyed to identify their educational priorities.[11] As LMIC nurses described the challenges faced in their work environments, it became apparent that educational curriculums could not be addressed until standards for pediatric oncology nursing care were established. Standards were drafted, reviewed, and refined through consultation with the PODC nursing community over the following 2 years to achieve consensus. In 2014, Baseline Standards for Paediatric Oncology Nursing in Low- and Middle-Income Countries were published as a position statement in Lancet Oncology[12] and as an article in Cancer Control in 2015.[13] Although many hospitals in low- and lower-middle income countries (L/LMIC) are currently unable to meet the nursing standards due to factors such as hospital overcrowding, lack of funding, and shortage of nurses with specialized education and clinical training, the standards provide a framework to strive for as efforts are made to build infrastructure and improve work environments of pediatric oncology programs worldwide.

To date, no international standards for pediatric oncology nursing are recognized. In 2014, the Association of Pediatric Hematology/Oncology Nurses published “Scope and Standards of Pediatric Hematology/Oncology Practice.”[14] Likewise, quality standards were created in England based on the National Institute for Health and Care Excellence publication “Improving Outcome in Children and Young People with Cancer,”[15] which included recommendations for nurse staffing. However, adoption of these and other country-based standards varies at the institution level, and none have been disseminated internationally.

The six baseline standards identify the core components recommended for pediatric oncology nursing programs. The standards address the following: (1) acuity-based staffing plans, with recommended nurse-to-patient ratios of maximum 1:5 in pediatric oncology units and 1:2 for critical care and bone marrow transplant (BMT) units, (2) formal pediatric oncology orientation for new nurses with specific learning objectives in theory and clinical skills, followed by 3–4 weeks of supervision by a skilled nurse, (3) minimum 10 h per year of continuing education, (4) acknowledgement of nurses as core members of the multidisciplinary team, with inclusion of nurses in patient rounds and meetings relevant to patient care, (5) access to resources for the provision of safe care including administration of chemotherapy, and (6) access to evidence-based policies and procedures to guide the delivery of nursing care, along with funding for locally directed nursing research. The standards have been well received by the international pediatric oncology community and endorsed by key academic pediatric cancer institutions, professional and parent groups, and nongovernmental organizations.[16]

After the publication of the baseline nursing standards, a PODC Nursing Baseline Standards Taskforce formed to develop a web-based survey to evaluate the extent to which hospitals providing pediatric cancer care worldwide are meeting these standards. This study presents the results of the survey and highlights the nursing disparities that must be addressed to improve outcomes of children with cancer in low- and middle-income countries.

2 | METHODS

A web-based survey was developed by the SIOP PODC Nursing Baseline Standards taskforce to offer nurses who care for children with cancer the opportunity to self-report on elements related to the six standards. To develop the survey instrument, specific criteria used to measure each standard were established using a modified Delphi technique. To establish content validity, eight expert pediatric oncology nurses representative of the six regions of the World Health Organization (WHO) member states reviewed the survey. A content validity index of 0.98 was achieved, with minor changes to the survey made on the basis of reviewer recommendations. The web-based REDCap™ survey was used to administer the questions and capture data. The survey consisted of a minimum of 32 questions and a maximum of 53 questions, depending on branching logic. Questions were nonsubjective. The survey began with a demographic section that focused on nurse responder and hospital characteristics, followed by questions grouped into six sections to address the components of each standard. Key educational and policy topics are not defined in the baseline standards; thus, the authors developed a list of educational and policy topics deemed most relevant to pediatric oncology nursing care for the purpose of the survey.

The survey was translated from English to Spanish, French, and Mandarin Chinese. The survey was emailed in August 2016 with a follow-up mailing in January 2017 to a convenience sample of 208 nurses caring for children with cancer. Email addresses were obtained from selected pediatric oncology–specific mailing lists and via professional contacts of taskforce members. A cover letter that described the intent of the research and the goal to publish the results (with data identifiable by country only) was also attached. Responses were accepted between August 2016 and February 2017. Responses were deemed ineligible if they were incomplete, or if there was a previous complete response received from a given institution (only one complete response per hospital was included to avoid duplication). A limited number of email contacts for nurses from LIC were available to our taskforce, resulting in a disproportionately low number of survey responses from nurses in LIC (Section 4). Thus, the LIC and LMIC's income responses were combined into one category (L/LMIC) at the statistician's recommendation.

3 | STATISTICAL ANALYSIS

Data were analyzed by using SAS v.9.4 (Cary, NC). The objective was to determine whether the institution's country income classification

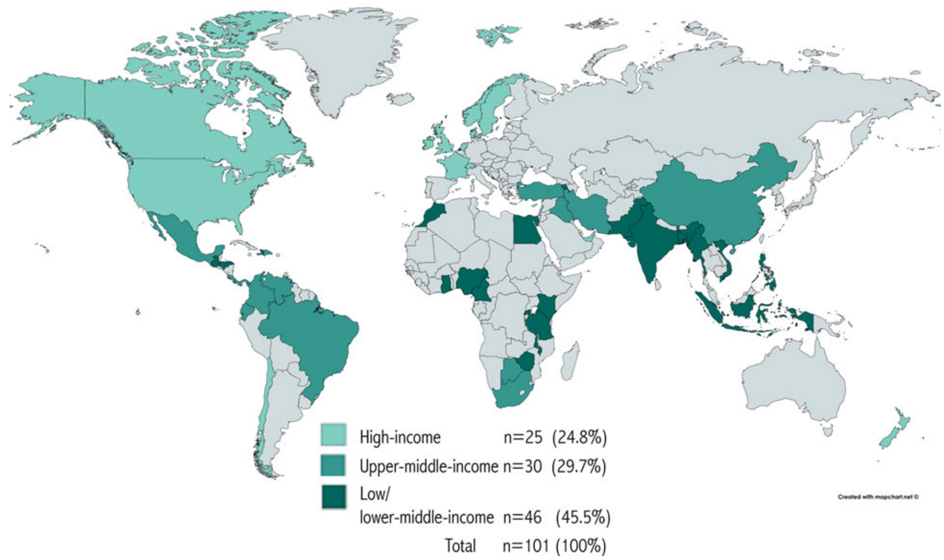

FIGURE 1 Participating countries by World Bank income classification

(CIC) was associated with components of each of the six baseline standards. Surveys were classified as per The World Bank new country classifications by income level 2017 into three income categories according to the hospital's country—L/LMIC, upper-middle income countries (UMIC), and HIC.[17]

Fisher's exact test was used throughout to test for association between the hospital characteristic and the three income levels. A *P*-value of less than 0.05 was used as the cut-off for statistical significance.

4 | RESULTS

Of the 208 surveys sent, 129 responses were returned (62%) and 101 met the eligibility criteria (48.6%) for inclusion. By CIC, the eligible responses per number of survey invitations were as follows: LIC = 5/13, LMIC = 41/79, UMIC = 30/66, and HIC = 25/50. The survey responses represented 54 countries and were categorized into three CIC categories—46 (45.5%) from L/LMIC, 30 (29.7%) from UMIC, and 25 (24.8%) from HIC (Figure 1). By hospital type, 42 participating hospitals were categorized as general hospitals, 41 as pediatric hospitals, and 18 as cancer specialty/national cancer institutes. A dedicated pediatric oncology ward was present in 92% of hospitals; a pediatric intensive care unit (PICU) was present in 69.3%, and a pediatric BMT unit in 43.6%. By years of experience, 1% of nurse responders had less than 1 year, 14% had 1–5 years, 21% had 6–10 years, and 64% had more than 10 years of experience. By educational background, 77% of nurse responders had a university nursing degree, 5% had a technical degree, 2% had auxiliary training, and 16% had “other degrees.” (Table 1). By language, 72% of surveys were completed in English, 19% in Spanish, 3% in French, and 6% in Mandarin Chinese.

4.1 | Standard 1—Acuity-based staffing plans

For inpatient wards, the association between the number of patients assigned per nurse and CIC was a significant factor in all shifts, including weekdays and weekends ($P < 0.0001$; Table 2). In the day shift, 13/46 (28%) of respondents in L/LMIC met the staffing standard of maximum five patients per nurse compared with 11/30 (37%) for those in UMIC and 21/25 (84%) in HIC. Presence of a PICU at the hospital was significantly associated with CIC ($P = 0.03$), as was the presence of a BMT unit ($P = 0.002$). Conformity to the PICU staffing standard of maximum two patients per nurse neared but did not reach significance. In hospitals with a pediatric BMT unit, there was no association between CIC and the ability to meet the standard of maximum two patients per nurse. One-third (33%) of nurses in L/LMIC reported that they were rotated between units, compared with 20% in UMIC and 4% in HIC ($P = 0.015$). Less than half (46%) of all pediatric oncology nurses reported that they used an instrument to assess patient acuity; this did not vary significantly by CIC.

4.2 | Standard 2—Formal orientation program

Table 3 shows that although this standard did not reach significance, the trend indicated that nurses from hospitals in HIC were more likely than those in L/LMIC or UMIC to report a formal orientation program (52% in L/LMIC, 63% in UMIC, and 80% in HIC, $P = 0.19$). Orientation of greater than two weeks was reported 30% of the time in L/LMIC and 37% in UMIC, compared with 60% in HIC ($P = 0.52$). The presence of defined learning objectives approached but did not reach significance by CIC ($P = 0.076$). The PODC Nursing Taskforce identified 12 topics essential for comprehensive pediatric oncology nurse education (Table 3). There was a significant association between CIC and the exclusion of critical topics such as overview of pediatric cancers ($P = 0.026$), neutropenic sepsis management ($P = 0.026$), pain assessment and management ($P = 0.012$), early detection and management of oncology emergencies ($P = 0.047$), and venous access management ($P = 0.029$). Other topics, such as safe chemotherapy administration, managing the side effects of cancer treatment, nutritional support, administration of blood products, infection prevention

TABLE 1 Characteristics of hospitals and nurse responders

	L/LMIC, n (%)	UMIC, n (%)	HIC, n (%)	Total, n (%)
Hospital characteristics	n = 46	n = 30	n = 25	n = 101
Hospital type				
Cancer specialty hospital/national cancer institute	10 (21.7)	3 (10)	5 (20)	18 (17.8)
Pediatric hospital	10 (21.7)	16 (53.3)	15 (60)	41 (40.6)
General hospital	26 (56.5)	11 (36.7)	5 (20)	42 (41.6)
Hospital funding source				
Public or government hospital	30 (65.2)	24 (80)	18 (72)	72 (71.3)
Private	10 (21.7)	3 (10)	5 (20)	18 (17.8)
Other	6 (13)	3 (10)	2 (8)	11 (10.9)
"Yes" response to the presence of:				
Separate unit for children with cancer	40 (87)	28 (96.7)	25 (100)	93 (92.1)
Pediatric intensive care unit for children with cancer	27 (58.7)	21(70)	22 (88)	70 (69.3)
Pediatric bone marrow transplant unit	13 (28.3)	13 (43.3)	18 (72)	44 (43.6)
Nurse responder characteristics				
Years of nursing experience				
<1	1 (2.2)	0 (0)	0 (0)	1 (1)
1–5	12 (26.1)	2 (6.7)	0 (0)	14 (13.9)
6–10	13 (28.3)	5 (16.7)	3 (12)	21 (20.8)
>10	20 (43.5)	23 (76.7)	22 (88)	65 (64.4)
Educational background				
Auxiliary/assistant	2 (4.4)	0 (0)	0 (0)	2 (2)
Technical	2 (4.4)	0 (0)	0 (0)	5 (5)
Professional (university degree)	36 (78.3)	22 (73.3)	20 (80)	78 (77.2)
Other	6 (13)	8 (26.7)	2 (8)	16 (15.8)

HIC, high-income countries; L/LMIC, low- and lower-middle-income countries; UMIC, upper-middle-income countries.

and control, and patient and family education were more frequently absent from orientation programs in L/LMIC, and often missing in UMIC and HIC as well. Palliative care education was reported by 45% of nurses overall. Respondents in L/LMIC, with the highest burden of mortality, reported that palliative care education was included in orientation 35% of the time compared with 43% for those in UMIC and 64% in HIC ($P = 0.067$) (Table 3).

4.3 | Standard 3—Continuing education

Table 3 shows that overall, 50% of responders met the minimum standard of 10 h per year of continuing education. This minimum standard was met by 46% of nurses in L/LMIC compared with 47% of nurses in UMIC and 60% in HIC ($P = 0.58$).

4.4 | Standard 4—Nurses as core team members

The survey had questions about inclusion of nurses on patient rounds, during treatment plan and consent discussions, and at multidisciplinary team and committee meetings, referring to institution-based committees where decisions about patient care are made. Table 4 shows the presence of nurses at patient rounds was consistent across CICs. However, the association between CIC and the inclusion of nurses in all other meetings was highly significant. In LMIC, 41% of nurses reported being present in meetings with patients at the time of diagnosis or relapse compared with 63% in UMIC and 84% in HIC ($P = 0.002$). Similar associations were found between CIC and inclusion of nurses in meetings to discuss treatment plans and consent ($P = 0.038$) and at multidisciplinary team ($P < 0.0001$) and committee ($P = 0.0007$) meetings.

4.5 | Standard 5—Access to resources for safe care

The provision of safe care relies on consistent access to materials that protect patients and caregivers from harm, such as hand-hygiene supplies, personal protective equipment to limit exposure to hazardous drugs and infected materials, and equipment such as intravenous (IV) infusion pumps for safe administration of medications. Table 5 shows that a significant correlation between CIC and access to resources for providing safe care was reported almost uniformly. There was a significant association between CIC and availability of hand-washing supplies such as alcohol-based gels ($P = 0.012$) and paper towels ($P = 0.0002$). Striking differences were noted in resources for safe administration of chemotherapy. While 63% of nurses in L/LMIC responded that they are responsible for preparing chemotherapy compared with 33% in UMIC and 12% of nurses in HIC ($P < 0.0001$), nurses in L/LMIC were significantly less likely to have access to

TABLE 2 Standard 1: Acuity-based staffing

Standard 1: Acuity-Based Staffing	L/LMIC, n (%)	UMIC, n (%)	HIC, n (%)	Total, n (%)	*P*-value
Pediatric unit caring for children with cancer	n = 46	n = 30	n = 25	n = 101	
Nurses care for five or less patients					
Day shift (Monday-Friday)	13 (28.3)	11 (36.7)	21 (84)	45 (44.6)	<0.0001
Afternoon shift	11 (23.9)	7 (23.3)	22 (88)	40 (39.6)	<0.0001
Night shift	11 (23.9)	5 (16.7)	18 (72)	34 (33.7)	<0.0001
Weekend shift	13 (28.3)	5 (16.7)	22 (88)	40 (39.6)	<0.0001
Nurses rotate from oncology unit	15 (32.6)	6 (20)	1 (4)	22 (21.8)	0.015
Acuity tool is used	18 (39.1)	13 (43.3)	15 (60)	46 (45.5)	0.35
PICU at hospital	n = 27	n = 21	n = 22	n = 70	0.03
Nurses care for two or less patients					
Day shift (Monday-Friday)	14 (51.9)	10 (47.6)	16 (72.7)	40 (57.1)	0.31
Afternoon shift	12 (44.4)	9 (42.9)	16 (72.7)	37 (52.9)	0.13
Night shift	11 (40.7)	8 (38.1)	16 (72.7)	35 (50)	0.11
Weekend shift	11 (40.7)	8 (38.1)	16 (72.7)	35 (50)	0.11
Pediatric BMT unit at hospital	n = 13	n = 13	n = 18	n = 44	0.002
Nurses care for two or less patients					
Day shift (Monday-Friday)	12 (92.3)	9 (69.2)	15 (83.3)	36 (81.8)	0.69
Afternoon shift	11 (84.6)	9 (69.2)	14 (77.8)	34 (77.3)	0.89
Night shift	8 (61.5)	9 (69.2)	11 (61.1)	28 (63.6)	0.92
Weekend shift	8 (61.5)	9 (69.2)	14 (77.8)	31 (70.5)	0.88

BMT, bone marrow transplant unit; HIC, high-income countries; L/LMIC, low- and lower-middle-income countries; PICU, pediatric intensive care unit; UMIC, upper-middle-income countries.

TABLE 3 Standards 2 and 3: Educational preparation of pediatric oncology nurses

	L/LMIC n (%)	UMIC n (%)	HIC n (%)	Total n (%)	*P*-value
Standard 2: Formal orientation program	n = 46	n = 30	n = 25	n = 101	
Orientation characteristics: "Yes" response to:					
New nurses receive protected time for orientation	24 (52.2)	19 (63.3)	20 (80)	63 (62.4)	0.19
Theory/clinical skills >2 weeks	14 (58.3)	11 (57.9)	15 (75)	40 (63.5)	0.52
Defined learning objectives present	20 (83.3)	18 (94.7)	18 (90)	56 (88.9)	0.076
Educational topics included in orientation program					
Overview of pediatric cancers	22 (47.8)	16 (53.3)	20 (80)	58 (57.4)	0.026
Neutropenic sepsis management	22 (47.8)	16 (53.3)	20 (80)	58 (57.4)	0.026
Early detection of oncology emergencies	21 (45.7)	17 (56.7)	19 (76)	57 (56.4)	0.047
Pain assessment and management	18 (39.1)	17 (56.7)	19 (76)	54 (53.5)	0.012
Palliative care education	16 (34.8)	13 (43.3)	16 (64)	45 (44.6)	0.067
Venous access management	19 (41.3)	19 (63.3)	18 (72)	56 (55.5)	0.029
Safe chemotherapy administration	24 (52.2)	19 (63.3)	18 (72)	61 (60.4)	0.25
Managing side effects of cancer treatment	24 (52.2)	18 (60)	19 (76)	61 (60.4)	0.14
Infection prevention and control	24 (52.2)	18 (60)	19 (76)	61 (60.4)	0.14
Blood product administration	23 (50)	18 (60)	18 (72)	59 (58.4)	0.19
Nutritional support	20 (43.5)	13 (43.3)	16 (64)	49 (48.5)	0.22
Patient and family education	22 (47.8)	16 (53.3)	17 (68)	55 (54.5)	0.29
Standard 3: Continuing education					
Nurses offered ≥10 h per year	21 (45.7)	14 (46.7)	15 (60)	50 (49.5)	0.58

HIC, high-income countries; L/LMIC, low- and lower-middle-income countries; UMIC, upper-middle-income countries.

TABLE 4 Standard 4: Inclusion of nurses as core team members

	L/LMIC	UMIC	HIC	Total	*P*-value
Standard 4: Nurses as core team members	n = 46	n = 30	n = 25	n = 101	
Nurse participation in:					
Physician/caregiver meetings at diagnosis or relapse	19 (41.3)	19 (63.3)	21 (84)	59 (58.4)	0.002
Physician/caregiver meetings to discuss treatment plan or consent	21 (45.7)	21 (70)	18 (72)	60 (59.4)	0.038
Daily rounds with physicians	42 (91.3)	26 (86.7)	22 (88)	90 (89.1)	0.78
Multidisciplinary team meetings	23 (50)	24 (80)	24 (96)	71 (70.3)	<0.0001
Multidisciplinary committees	15 (32.6)	15 (50)	18 (72)	48 (47.5)	0.007

HIC, high-income countries; L/LMIC, low- and lower-middle-income countries; UMIC, upper-middle-income countries.

TABLE 5 Standards 5 and 6: Resources for the provision of safe care

	L/LMIC	UMIC	HIC	Total	*P*-value
	n = 46	n = 30	n = 25	n = 101	
Standard 5: Safety resources					
Intravenous infusion pumps	36 (78.3)	30 (100)	25 (100)	91 (90.1)	0.0006
Soap and running water for hand washing	44 (95.7)	30 (100)	25 (100)	99 (98)	0.5
Paper towels for hand washing	30 (65.2)	27 (90)	25 (100)	82 (81.2)	0.0002
Alcohol-based hand sanitizer gel	45 (97.8)	24 (80)	25 (100)	94 (93.1)	0.012
Powder-free gloves	41 (89.1)	27 (90)	23 (92)	91 (90.1)	1
Nitrile gloves for handing chemotherapy	16 (34.8)	12 (40)	20 (80)	48 (47.5)	0.0007
Fluid-resistant aprons (gowns)	25 (54.4)	22 (73.3)	22 (88)	69 (68.3)	0.011
Masks	42 (91.3)	29 (96.7)	20 (80)	91 (90.1)	0.16
Eye protectors and face shields	24 (52.2)	24 (80)	20 (80)	68 (67.3)	0.013
Chemotherapy preparation					
Nurse prepares chemotherapy	29 (63)	10 (33.3)	3 (12)	42 (41.6)	<0.0001
Pharmacist prepares chemotherapy	12 (26.1)	16 (53.3)	20 (80)	48 (47.5)	<0.0001
Physician prepares chemotherapy	6 (13)	4 (13.3)	0 (0)	10 (9.9)	0.15
Chemotherapy prepared in Class II biological safety cabinet	28 (60.9)	29 (96.7)	21 (84)	78 (77.2)	<0.0001
Standard 6: Access to evidence-based policies and procedures to guide care					
Hospital provides written policies	33 (71.7)	27 (90)	24 (96)	84 (83.2)	0.009
Policies relevant to pediatric cancer care:					
Chemotherapy	27 (58.7)	25 (83.3)	24 (96)	76 (75.2)	0.0009
Medication administration	29 (63)	25 (83.3)	23 (92)	77 (76.2)	0.013
Narcotics or high-alert medications	24 (52.2)	19 (63.3)	22 (88)	65 (64.4)	0.008
Transfusion of blood products	31 (67.4)	27 (90)	24 (96)	82 (81.2)	0.004
Infection control or hand hygiene	31 (67.4)	27 (90)	24 (96)	82 (81.2)	0.004
Management of febrile neutropenia	23 (50)	22 (73.3)	22 (88)	67 (66.3)	0.003
Care of venous access devices	23 (50)	26 (86.7)	24 (96)	72 (72.3)	<0.0001
Managing emergency situations	25 (54.4)	20 (66.7)	22 (88)	67 (66.3)	0.012
End-of-life care	23 (50)	19 (63.3)	22 (88)	64 (63.4)	0.005

HIC, high-income countries; L/LMIC, low- and lower-middle-income countries; UMIC, upper-middle-income countries.

personal protective equipment (PPE) such as nitrile gloves ($P = 0.0007$), fluid-resistant gowns ($P = 0.011$), and protective eyewear/face shields ($P = 0.013$) than those in HIC. A significant association was found between CIC and consistent access to IV infusion pumps (L/LMIC 78% vs UMIC and HIC 100%; $P = 0.0006$). Further, 26% of respondents in L/LMIC and 53% in UMIC compared with 80% of respondents in HIC reported that a pharmacist was available to prepare chemotherapy ($P < 0.0001$). There was a strong significant association between CIC and preparation of chemotherapy in a Class II biological safety cabinet[18] ($P < 0.0001$).

4.6 | Standard 6—Evidence-based policies and procedures

Safe pediatric oncology nursing care is guided by evidence-driven policies and procedures that are readily available in the care environment. There was a significant association between CIC and the presence of written policies and procedures ($P = 0.009$; Table 5). Compared with hospitals in UMIC and HIC, those in L/LMIC were significantly less likely to have policies and procedures for medication administration ($P = 0.013$); chemotherapy administration ($P = 0.0009$); transfusion of blood products ($P = 0.004$); administration of high-alert medications, defined by the Institute for Safe Medical Practice as drugs that bear a heightened risk of causing patient harm when used in error[19] ($P = 0.008$); infection control, including hand hygiene, ($P = 0.004$); management of febrile neutropenia ($P = 0.003$); care of venous access devices ($P < 0.0001$); management of clinical emergencies ($P = 0.012$); and end-of-life care ($P = 0.005$).

5 | DISCUSSION

The findings from our survey clearly demonstrate the disparity in pediatric oncology nursing practices in resource-rich and resource-poor regions of the world. Nurses in L/LMIC consistently reported working in environments that do not comply with the baseline standards. They reported inadequate staffing, gaps in pediatric oncology education, lack of recognition of nurses as core team members, limited resources for providing safe care, and the absence of essential written policies and guidelines. Nurses in L/LMIC are often tasked with responsibilities that are performed by other disciplines in HIC and are less likely to be given protection against exposure to chemical and biological hazards in the workplace. It is important to note that nurses in HIC also reported not meeting the standards in several instances. For example, 18/25 (72%) of nurses in HIC reported meeting the staffing standard for pediatric inpatient wards on the night shift; (Table 2), key educational content was missing from curriculums across all income levels (Table 3), and only 60% of nurses from HIC reported meeting the standard of minimum 10 h per year of continuing education. This implies variation by institution within all income categories.

With regard to staffing, pediatric oncology nurses in L/LMIC were less likely to meet the recommended nurse-to-patient ratio of one nurse to maximum five patients. This is not surprising, considering the global nursing shortage and expense related to nursing personnel.[20] Hospital administrators often target nursing budgets in an effort to cut costs, despite evidence showing that inadequate nurse staffing levels are associated with increased healthcare costs due to adverse events and longer hospitalizations.[21] Investing in nursing can improve the quality of care and reduce turnover rates and burnout.[22,23] However, the mere addition of nurses to the workforce is not sufficient. Aiken et al recommended that nursing characteristics such as nurse workload, education, and work environment be considered in combination.[24] Lowering the patient-to-nurse ratio has markedly improved patient outcomes in hospitals with good work environments but not in those with average or poor work environments.[25] The educational level of nurses also affects patient mortality and failure-to-rescue rates in patients undergoing surgery.[26] Nurses in L/LMIC and UMIC report that formal education in core pediatric oncology topics is often lacking when they enter the service.[27] Inadequacy in educational preparation coupled with the high workload of nurses and inadequate medical resources raise grave concerns about patient safety, considering the vulnerability of the patient population and the complex treatment setting. The absence of evidence-based policies and procedures to guide pediatric oncology nursing care worsens this concern. Day et al note that education departments in L/LMIC are often staffed with few nurses but are responsible for educating hundreds of employees, which reduces the feasibility of providing orientation programs in specialty areas. Nurses may receive "on-the-job" training as opposed to a structured program based on learning outcomes and competency verification. This deficit highlights the need for improved hospital-based education programs focused on subspecialties in all settings.[28]

By introducing a pediatric oncology nurse educator, some hospitals in Latin America have addressed the lack of specialized orientation and continuing education. Dedicated nurse educators provide instruction in core pediatric oncology nursing theory and clinical skills to new nurses as well as ongoing education for all staff. This model has proven to be sustainable for more than 10 years in Latin America and has been replicated in other resource-limited countries such as Pakistan.[29–31] Rotation of nurses is another major impediment to delivering quality care. Children undergoing cancer therapy require highly specialized treatment and close monitoring for life-threatening adverse effects. To build competency, nurses require educational preparation supplemented with clinical experiences.[32] Rotation hinders nurses from developing knowledge and skills through experience and practice.

The survey also revealed that nurses in limited-resource regions are less likely to be included in patient meetings, treatment plan and consent discussions, and multidisciplinary team and committee meetings related to patient care. Exclusion as core team members prevents nurses from being well informed about their patients, thereby limiting the nurses' ability to serve as patient advocates and educators. Nurses are well positioned to teach patients and families important topics such as recognizing treatment complications and the importance of treatment adherence. This has critical implications in L/LMIC, where toxicity-related deaths and treatment abandonment are disproportionately high. Factors such as parental socioeconomic status, literacy, and beliefs about cancer are determinants of treatment abandonment in low-resource settings, which highlights the need for education and reinforcement of treatment goals in these settings.[33]

Our study has limitations. Despite a nearly 50% survey response rate, data were obtained by using a convenience sample and are therefore not entirely representative of the settings for nurses caring for children with cancer globally. Underrepresentation from nurses in LIC may be related to factors including the following: (1) fewer nurse contacts in LIC were known, indicating that nurses caring for children with cancer in LIC are less likely to have professional/organizational connections outside of their hospital, (2) only nurses with access to email, a computer with reliable internet, and protected time could complete the survey, and (3) many LIC do not have recognized, formal pediatric oncology programs. Of interest is that when the five LIC were analyzed separately, none met the staffing standard for pediatric wards of one nurse to maximum five patients. None have an intensive care unit or BMT unit, and three out of five reported no formal orientation program for new nurses caring for children with cancer. Four out of five reported that nurses are responsible for preparing chemotherapy without pharmacy support. These results indicate that nurses in LIC may be even less likely to achieve the baseline standards than reported in the combined L/LMIC results. Translations of the survey were available in English, Spanish, French, and Mandarin Chinese, but many nurses do not speak one of these as their primary language. Institutional data were reported by one nurse leader from each hospital, and therefore may be limited to a single person's knowledge of the pediatric oncology program. Nurses are reliable informants of the quality of hospital care, given the amount of time they are present at the bedside[34]; however, surveys in general are limited because of the nature of self-reporting. In addition, the classification of hospitals into one of three categories on the basis of CIC of the country provided a useful but highly simplified measure of the actual level of resource scarcity or abundance in these hospitals. Given our findings, future studies need to analyze in detail the quality of orientation programs, policies and procedures, continuing education, and details regarding resources for safe care.

In conclusion, safe delivery of nursing care is an essential component of a successful pediatric oncology program. Despite the limitations, our findings build on the evidence that nurses in low-resource regions encounter serious obstacles in the care of children with cancer and their families, providing information that was previously lacking in the literature and offering directions for ongoing research. This work is relevant to hospital administrators, policy makers, ministries of health, and other healthcare professionals who strive to improve access to high-quality care for children with cancer. The WHO Global Initiative for Childhood Cancer launched in 2018 with the aim of reaching at least a 60% survival rate for children with cancer by 2030.[35] Our findings will be useful to this initiative, which strives to expand the capacity of countries to deliver best practices in pediatric oncology care. We advocate a pediatric oncology nursing workforce supported by adequate staffing, specialized and ongoing education, inclusion in decision making, sufficient resources for safe care, and availability of evidence-driven patient care policies. Future directions include the development of a standards-based assessment tool that will help nurse leaders in LMIC identify strengths and weaknesses of their individual programs and develop actionable and realistic goals. Assessing the feasibility of achieving the baseline standards in low resource settings must be based on observation of nursing practice within the context of local resources and culture. Further research is needed to analyze the link between achieving the nursing standards and better patient outcomes in children with cancer. These interventions will move this work beyond surveys and into interventional studies, building the case that promoting core standards for pediatric oncology nursing will contribute to improved survival of children with cancer in LMIC.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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