Burden of treatment in the face of childhood cancer: A quantitative study using medical records of deceased children

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Abstract
Lived experiences of childhood cancer patients and their families have been described as interrupted and as a loss of normal life. Apart from symptoms due to the cancer disease, families continuously experience burden of treatment. Since coping capacities are unique to each individual, we captured variables that offer objective measures of treatment burden, with a particular focus on the disruptive effects of treatment on families' lives. Our sample was comprised by 193 children that died of cancer. Medical records were extracted retrospectively. Quantitative data were statistically analysed with respect to variables related to treatment burden. Deceased children with cancer and their families faced a significant burden of treatment. Results revealed that deceased leukaemia patients had a higher number of inpatient stays, spent more time in the hospital both during their illness and during the last month of their life, and were more likely to die in the hospital when compared to deceased patients with CNS neoplasms and with other diagnoses. Our findings highlight the disruptive effects of treatment that are likely to have [...]
INTRODUCTION

Worldwide, approximately 200,000 children are diagnosed with cancer each year, among them 50,000 from high-income countries with a survival rate around 80% (Kellie & Howard, 2008). Living with a life-threatening disease like cancer represents a burdensome and difficult time for both the paediatric patient and the family (De Clercq, Elger, & Wangmo, 2017).

1.1 The cancer experience for children and their families

A cancer diagnosis marks an abrupt break in life. Lived experiences of children with cancer and their families have been described as an interrupted one with limited opportunities to engage in leisure activities and difficulties in sustaining existing friendships (Bjork, Wiebe, & Hallstrom, 2005; Di Battista et al., 2017; Griffiths, Schweitzer, & Yates, 2011). Cancer diagnosis of a child is often described as a loss of normal family life (Badarau et al., 2015; De Clercq et al., 2017; Patterson, Holm, & Gurney, 2004). Moreover, children diagnosed with cancer experience being isolated from friends and family members (Coyne, 2006; Hokkanen, Eriksson, Ahonen, & Salantera, 2004), which may have negative consequences on their well-being (Enskar, Carlsson, Golsater, & Hamrin, 1997; Gibson, Aldiss, Horstman, Kumpunen, & Richardson, 2010; Hinds et al., 2004).

The interruptive effect of cancer on the everyday life of the child as well as his or her family can be attributed to the treatment procedures, their corresponding appointments, and waiting times...
In a qualitative study, children evaluated the latter as an even more significant stressor than the treatment itself because during waiting times they feel alone and anxious about what will follow (Palmer, Mitchell, Thompson, & Sexton, 2007). Other studies show that children experience treatment procedures as highly stressful and their situation as one of having no choice but to undergo treatment (Griffiths et al., 2011; McCaffrey, 2006). In light of the changes that a cancer diagnosis brings, families seek to maintain as much of their former life as possible (Bjork et al., 2005; Tarr & Pickler, 1999). It is thus recommended that the inpatient stays of a child should be limited to what is necessary by drawing on outpatient visits and provision of care at home (European Association for Children in Hospital, 2016; Monterosso & Kristjanson, 2008). In support of this recommendation, a study found that when chemotherapy treatment was provided at home versus in the hospital, children had more opportunities to engage in normal activities, parents were financially less burdened and saved time, and families’ overall life was minimally disrupted (Stevens et al., 2006).

In cases where children died due to cancer, studies found that most parents not only plan for their child’s death but they also favour their home as the location for death as well as for end-of-life care (Dussel et al., 2009; Kassam, Skaidaresis, Alexander, & Wolfe, 2014; Vickers, Thompson, Collins, Childs, & Hain, 2007). Besides the explicit parental wish that the child dies at home, various other determinants of place of death for children dying due to cancer have been identified, for example, diagnosis, length of last hospital admission, ethnicity, gender, or a child’s age (Cawkwell, Gardner, & Weitzman, 2015; Klopfenstein, Hutchison, Clark, Young, & Ruymann, 2001; Kurashima, Latorre Mdo, Teixeira, & De Camargo, 2005). However, a systematic literature review found no compelling evidence that families opt home as the place of death (Bluebond-Langner, Beecham, Candy, Langner, & Jones, 2013).

### 1.2 The burden of (cancer) treatment

Apart from symptoms due to the underlying cancer disease, families continuously experience burden due to the treatment(s) that the child must undergo. Burden of treatment is different from burden of illness. The latter expression rather refers to the physical and psychological effects caused by the illness (May, Montori, & Mair, 2009). The former points not only to the treatment side effects but to the burden which is associated with the treatment of an illness (Sav et al., 2015); and “encompasses (among other things) the disruptive effects that treatment has on working lives (for example, having to repeatedly go to clinics for tests) and on social lives (e.g., having to curtail activities because of treatment side effects)” (Mair & May, 2014, p. 1). Moreover, according to a literature review on the different conceptualisations of burden of treatment, the latter is in its nature dynamic, comprises both subjective and objective dimensions and distinguishes between antecedents and consequences of burden (Sav et al., 2015). Finally, burden of treatment theory refers to the importance of relational networks when facing treatment because these “collective agents” are able to provide more resources than the individual patient (May et al., 2014).

Even though burden of treatment is unavoidable, it can function as an indicator for the quality of care provided or managed by the health care team (Mair & May, 2014). A better understanding of burden of treatment may facilitate an improved understanding of the family’s situation and preferences which, in turn, is a prerequisite for a minimal disruptive medicine that reduces patients’, families’, and caregivers’ overall burden (May et al., 2009).

### 1.3 Study purpose

Although it is understood that childhood cancer entails high burden of treatment as well as high burden of illness, there is a lack of studies that allow complete understanding of burden of treatment for children with cancer and their families. Our empirical work seeks to assess different indicators of burden of treatment for children who died of cancer through a study carried out in Swiss Pediatric Oncology Group (SPOG) centres. Since coping capacities are unique to each individual, we captured variables that offer objective measures of burden of treatment, namely time periods and count information, with a particular focus on the disruptive effects of treatment on families’ lives. Examples of such variables include the number and duration of a child’s inpatient stays which, among others, cause the above mentioned disruptive effects on families’ daily lives. We retrospectively extracted these variables from medical records of children who died due to childhood cancer. This paper addresses two research questions: (a) a data-based description of what the actual burden of treatment for childhood cancer patients who died of the illness and their families is in Switzerland, and (b) whether burden of treatment differs by different types of cancer.

### 2 METHODS

#### 2.1 Study design

In Switzerland, there are nine SPOG centres. We collected data from seven of them based on prior research collaboration. A retrospective review of medical records of paediatric oncology patients who died between 1 January 2008 and 31 December 2014 was conducted. Ethical approval was obtained from the responsible ethics committees in Switzerland.

#### 2.2 Study population

We extracted information from medical records of children who met the following inclusion criteria: the child (a) was diagnosed with cancer and received treatment in one of the participating SPOG centres, (b) was less than or equal to 18 years of age at diagnosis, and (c) died of cancer or treatment-related complications. We obtained information on which children died at each participating SPOG centre from the Swiss Childhood Cancer Registry (SCCR). This information
enabled us to exclusively search for children that met the inclusion criteria (note: SCCR includes information on both living and deceased paediatric oncology cases and reports data on adolescents up to 20 years of age). This study confined their analysis to children who died due to childhood cancer in response to our previous project on children’s inclusion in treatment-related decision-making in which we were unable to recruit palliative cases due to hesitancy to bring up this issue within discussions with families (Ruhe, Badarau et al., 2016; Ruhe, Wangmo et al., 2016; Wangmo, De Clercq et al., 2017; Wangmo, Ruhe et al., 2017). Therefore, to examine decision-making regarding palliative care we decided to exclusively analyse medical records of deceased children.

### 2.3 Data extraction form

A data extraction form was designed to gather data on the following aspects from the medical records: (a) demographics, (b) diagnosis and relapse(s), (c) treatments received, (d) decision-making in the course of treatment, and (e) death of the child. Items were developed from the research team’s knowledge in the field and based on discussions with collaborating physicians. The extraction form consisted of items with categorical responses (e.g., centre, sex, diagnosis), continuous variables (e.g., age, number of inpatient stays, time being inpatient), and open-ended items (e.g., Please note any information about the transition from curative to palliative phase). The data extraction form was used as a digital version (i.e., Microsoft Word document).

### 2.4 Data collection

Before starting data collection, we contacted the collaborating physician of the respective SPOG centre in order to be referred to the SPOG centre’s data manager who is responsible for research-related data requests. The data manager created access to the archive, organised working spaces, and remained at the disposal for further questions. Most medical records were available in paper form. In cases of already digitalised records, we extracted the relevant information from the digital records. Four research assistants gathered relevant data from the medical records using the extraction form. Data were collected centre by centre and onsite between July 2015 and July 2016. Researchers discussed the first five extractions aiming for standardisation of extracting and continuously discussed their extractions, when needed. Each child was anonymised through a participant code at the time of extraction. This code was created based on a predefined algorithm.

### 2.5 Study sample

Based on the list that was provided by SCCR 201 children died during the study period and were treated in one of the participating SPOG centres. For seven cases, in consultation with collaborating oncologists, the research team decided that the diagnosis was not cancer and therefore excluded them, and one child was over the age of 18 years at diagnosis. After excluding these eight cases, a final sample of 193 cases remained.

### 2.6 Statistical analyses

A research assistant entered all extracted records into SPSS 22 (SPSS Inc, Chicago, IL) and another randomly checked 15% of the data for correctness of data entry. Statistical analyses were performed using SPSS 22 (SPSS Inc, Chicago, IL). Since not every item of the extraction form was always contained in all medical records or could be found, sample sizes for some variables were less than the total number of data collected (N = 193). Information on palliative care and transition to palliative care are discussed in another paper. Related to the goal of this project, children’s and families’ burden of treatment was measured using the following seven variables: (a) number of inpatient stays, that is, the sum of all inpatient stays a child went through (n = 162); (b) total time being inpatient representing the durations of all inpatient stays (n = 162); (c) duration of illness, which was defined as the time between diagnosis and death of the patient, thereby capturing the total time span a child had lived with illness (n = 185); This definition intends to capture both active treatment and in remission time spans with the underlying rationale that even in periods when the child was in remission families’ daily life was still somehow affected by the illness, for example, by regular follow-up appointments, uncertainty because of possible relapses, or long-term effects on physical and psychological health; (d) inpatient-proportion was computed using b and c (n = 154), for example, a patient was hospitalised 30 days and the entire duration of illness was 180 days, the percentage equals 16.7%; and (e) days being inpatient during the last month of a child’s life, that is, burden through hospitalisations in the last month of their lives (n = 157). Finally, we analysed (f) where a child died, namely at home or in the hospital (n = 161), and (g) who was present at death (n = 119).

In a first step, variables were analysed descriptively. In a second step, we compared three diagnosis-based subgroups within our sample of deceased childhood cancer patients, namely leukaemia patients, CNS neoplasms patients, and patients with other diagnoses employing analysis of variance and Chi-square test of independence. For the analyses, reported p values are two-sided and statistical significance level was set at p < 0.05.

### 3 RESULTS

#### 3.1 Characteristics of the sample

Fifty-five per cent (107 of 193) of the deceased children were male. Mean age at diagnosis was 7.2 years, ranging from 0 to 17 years of age. Of the 12 categories (I-XII) of International Classification of Childhood Cancer 3 (ICCC), the most frequent diagnoses were as follows: CNS neoplasms (ICCC-III, 34.2%) and leukaemia (ICCC-I, 27.5%). The other ten categories were also
TABLE 1  Sample characteristics (N = 193)

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Mean (Mdn, SD)</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Sex (male)</td>
<td>55.4%</td>
<td></td>
</tr>
<tr>
<td>Age at diagnosis</td>
<td>7.2 (6.0; 5.1)</td>
<td></td>
</tr>
<tr>
<td>Age at death (n = 179)</td>
<td>9.8 (9.0; 5.2)</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Main diagnostic groups according to ICCC</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNS neoplasms (III)</td>
<td>34.2</td>
</tr>
<tr>
<td>Leukaemias (I)</td>
<td>27.5</td>
</tr>
<tr>
<td>Neuroblastoma &amp; other peripheral nervous cell tumours (IV)</td>
<td>11.9</td>
</tr>
<tr>
<td>Malignant bone tumours (VIII)</td>
<td>8.3</td>
</tr>
<tr>
<td>Lymphomas &amp; reticuloendothelial neoplasms (II)</td>
<td>6.2</td>
</tr>
<tr>
<td>Soft tissue &amp; other extraosseous sarcomas (IX)</td>
<td>6.2</td>
</tr>
<tr>
<td>Others</td>
<td>5.7</td>
</tr>
</tbody>
</table>

Note. ICCC, international classification of childhood cancer 3.

represented in our sample, and we collapsed the least six as “others” (Table 1).

As expected, compared to the SCCR, a national dataset that includes all children diagnosed with cancer (Swiss Childhood Cancer Registry, 2016), due to the different mortality rates, leukaemia was underrepresented in our sample of deceased children (27.5% vs. 33.6%), whereas CNS neoplasms (34.2% vs. 22.9%) and neuroblastomas were overrepresented (11.9% vs. 6.1%). Patients’ age was overall comparable to SCCR (in bracket): 0–4 years 37.8% (35.4%), 5–9 years 26.9% (21.3%), 10–14 years 24.4% (22.7%), and 15–18 years 10.9% (20.6%).

In most of the cases (77.3%; 140 of 181 children) cancer treatment protocols were followed at diagnosis. In more than half of the cases (54.4%; 99 of 182) other hospitals were consulted for further support or advice. More than three quarter of the children received palliative care (77.6%, 132 of 170), palliative care is defined here as opposed to curative care, that is, palliative care means here a supportive care approach that was taken once it was agreed that the treatment goal was not anymore curative). This finding means that almost one quarter of the deceased children died during supposedly curative care and did not go through a phase where it was transparent that they were dying and during which they received only supportive palliative care (22.4%, 38 out of 170). Among them, nine children died due to unexpected complications or side effects of the treatment.

3.2 | Burden of treatment

Our analysis focused on variables indicating deceased children’s burden of treatment (Table 2). On average, children from our sample had 13 inpatient stays during their illness course, which amounted to 117 days in the hospital. During the last month of their lives, the deceased children were hospitalised for an average of 10 days. Overall, the majority of the children did not die at home: 55.9% died in the hospital (90 of 161) and 0.6% (1 of 161) in a supportive care centre. Still, a relatively large minority of 43.5% of the children died at home (70 of 161). Looking only at those children who received palliative care (and for whom we were able to gather information on location of death), the numbers change as follows: 53.7% died at home (66 of 123), 46.3% in the hospital (57 of 123). At the time of death, in almost all of the cases parents were present except for four cases.

Figure 1 provides detailed information on burden of treatment, that is, number of inpatient stays, time spent in inpatient care, and illness duration. First, deceased children’s burden due to the number of inpatient stays ranges from 1 to 39 stays with almost one-third of them having more than 16 inpatient stays. Additionally, 1 in 10 children was admitted to the hospital more than 25 times during the entire illness period (Figure 1). Second, concerning inpatient time, ranging from 2 to 581 days, one in six children lived in the hospital for 6 months or more (Figure 1). Also two-fifths of the sample had between 3 and 6 months of inpatient stays. Third, the overall duration of illness ranged from 1 day to 5,582 days (equalling around 183 months or 15 years respectively), with more than one-third of the children undergoing treatment for <1 year and almost one in five children for more than 4 years.

To further understand the burden of treatment in our sample, we computed the percentage of time spent in the hospital during the entire duration of illness. The results show that almost one-third of our deceased children sample spent <10% of their time during their entire illness duration in the hospital and more than one quarter between 10% and 20%. Almost one in eight children spent more than half of their illness duration in the hospital (Figure 2). Furthermore, 29% of the children were hospitalised between 1 and 10 days during the last month of their life, and 1 in 10 children was hospitalised the entire last month of his or her life (Figure 2). Moreover, an exploratory independent samples t test revealed that children who died during curative treatment spent significantly more days in the hospital (n = 24, M = 16.8, SD = 11.7) than children who died during palliative care (n = 112, M = 8.2 days, SD = 9.7), t (134) = −3.779, p = 0.000.
3.3 | Burden of treatment: comparisons among diagnostic groups

Based on the 12 diagnostic categories of ICCC of our sample, we reclassified them into those who died with: (a) leukaemias (27.5%), (b) CNS neoplasms (34.2%), and (c) other diagnoses (38.3%). Leukaemia and CNS neoplasms were chosen to represent individual groups because they formed the two biggest groups in our sample and were already used in studies on paediatric oncology (Cawkwell et al., 2015; Jalmsell et al., 2013; Klopfenstein et al., 2001). Since summing up the remaining 10 categories of ICCC resulted in a comparably big subgroup, they were grouped into the residual category "other diagnoses". Hereinafter, this diagnosis variable is referred to as "three diagnostic groups". Subsequently, analysis of variance (Table 3) and Chi-Square test of independence were conducted for variables related to children's burden of treatment.

Analysis of variance revealed that there were significant effects of the diagnostic groups on the deceased children's number of inpatient stays, the days being inpatient, the inpatient-proportion, and inpatient days during the last month of life. Post hoc comparisons for the four significant results were conducted in order to see which diagnostic group or groups differed from one another.

First, with respect to the number of inpatient stays, a post hoc Tukey test showed that both leukaemia patients (M = 14.3, SD = 9.0) and patients with other diagnoses (M = 15.8, SD = 9.0) had significantly more inpatient stays than those patients with CNS neoplasms (M = 8.16, SD = 7.9). There was no significant difference between leukaemia patients and patients with other diagnoses (Figure 3).

Second, for days being inpatient, a post hoc Games–Howell test revealed that leukaemia patients (M = 155.8, SD = 122.0) had significantly more days being inpatient than patients with CNS neoplasms (M = 84.5, SD = 88.9). No other pairwise post hoc comparison revealed a significant difference (Figure 3).

Third, concerning inpatient-proportion, a post hoc Tukey test showed that leukaemia patients (M = 36.7%, SD = 26.4%) spent significantly more time of their overall illness duration in the hospital than both patients with CNS neoplasms (M = 21.9%, SD = 27.8%) and those with other diagnoses (M = 22.3%, SD = 19.0%). The latter two did not differ significantly (Figure 3).

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**FIGURE 1** Inpatient stays and illness duration. w, week; m, month; y, year

**FIGURE 2** Inpatient-proportion and days being inpatient during last month. d, day; m, month
Fourth, regarding days being inpatient during the last month of life, a post hoc Tukey test showed that leukaemia patients ($M = 15.8$, $SD = 10.9$) were hospitalised for more days than both patients with CNS neoplasms ($M = 6.6$, $SD = 9.8$) and the remaining with other diagnoses ($M = 8.4$, $SD = 9.7$). The latter two did not differ significantly (Figure 3).

Finally, the relation between the place of death (at home or in the hospital) and the diagnostic groups was significant, $\chi^2 (2, N = 160) = 15.9$, $p = 0.000$, $V = 0.32$, indicating that the diagnostic group has an impact on whether a child dies at home or in the hospital. Post hoc tests (Bonferroni correction was applied) revealed that leukaemia patients (81.8%) were more likely to die in the hospital ($p = 0.000$) than the total sample (56.5%). There was no significant result for patients with CNS neoplasms or for patients with other diagnoses (Figure 3).

4 | DISCUSSION

Overall, assessing the treatment-related burden descriptively reveals that deceased children with cancer and their families face a significant number of inpatient stays and long hospitalisations. Undoubtedly, the many inpatient visits lead children to miss out on school and parents from work, changes in both familial and social relations, limited opportunities for leisure time activities, as well as a
general physical and psychological strain. Such effects of childhood cancer are described as "rough spots" (Woodgate, 2006; Woodgate & Degner, 2002, 2003). Since our sample was exclusively comprised of children who died due to cancer, they may have faced a higher burden of treatment. As a consequence, further research examining burden of treatment among children who survived is needed.

4.1 | Deceased Leukaemia childhood cancer patients: the higher burden of treatment

Specifically, deceased leukaemia patients faced an almost double burden (number of inpatient stays and time being inpatient) compared to those patients with CNS neoplasms. It is evident that, as for children with other cancer diagnoses, leukaemia patients’ quality of life is affected, by changed relationships with family members and friends and by decreased number of participation in social activities (Hicks, Bartholomew, Ward-Smith, & Hutto, 2003; Waters, Wake, Hesketh, Ashley, & Smibert, 2003). Furthermore, it is shown that leukaemia patients must cope with a higher burden of disease, measured by patient-reported function than patients with CNS/solid tumours (Dobrozsi, Yan, Hoffmann, & Panepinto, 2015). Besides, our findings of more and overall longer inpatient stays for deceased patients with leukaemia is particularly relevant, since burden of treatment for children with leukaemia might be underestimated given the comparably good prognosis for this diagnostic group (Dobrozsi et al., 2015) and leukaemia being the most common type of childhood cancer. Such an underestimation might result from the so-called halo effect, that is, the tendency to let one key characteristic of a person or a situation (e.g., very good prognosis) outshine other characteristics (e.g., burden due to the disease and treatment) (Kahneman, 2011).

Regarding the percentage of time spent in the hospital during the entire duration of illness (inpatient-proportion) and the number of days being inpatient during the last month of life our findings reveal that our sample of leukaemia patients spent more time in hospital than the other diagnostic groups, both during their entire illness and during the last month of their life. These results correspond to a study which reported longer last hospital stays for leukaemia patients (Klopfenstein et al., 2001). One study found an association between more than 10 hospital days during the last month of life and lower quality of care ratings by physician (Mack et al., 2005). Against the background of relationship between longer hospitalisations and quality of care, the highly interrupted daily life (Bjork et al., 2005; Di Battista et al., 2017), difficulties to maintain social relationships and accompanying isolation (Enska et al., 1997; Gibson et al., 2010; Hokkanen et al., 2004), and affected familial relations (Hokkenen et al., 2004; Patterson et al., 2004) especially apply to leukaemia patients. Spending more time in the hospital not only decreases the odds of benefitting from protective factors, it also magnifies children's major stressors, for example, those associated with treatment procedures, loss of control and the hospital environment (McCaffrey, 2006). In addition to the higher burden due to treatment found in our study, another revealed that hospitalised children were also burdened by more symptoms than outpatients (Zhukovsky, Herzog, Kaur, Palmer, & Bruera, 2009).

Finally, compared to the overall sample leukaemia patients were less likely to die at home. Similar results were reported in two US studies (Cawkwell et al., 2015; Klopfenstein et al., 2001). Low home death rates are not problematic per se as a literature review concluded that evidence is lacking for the notion that most families wish for death at home (Bluebond-Langner et al., 2013). With respect to our results, it needs to be further examined why leukaemia patients are less likely to die at home and relevant other factors that determine place of death, such as sex of the child or educational level of the mother (Kurashima et al., 2005). If parents of deceased leukaemia patients or the children themselves are less likely to prefer home as the place of death, for instance, because of a higher stress and strain of providing end-of-life care at home as compared to children with other cancer diagnoses, the lower proportion of death taking place at home can be attributed to parental or children's wishes and are therefore justified. On the contrary, if they show the same preference for home as the place of death as other parents and children, the treating staff should facilitate the realisation of these preferences. In the latter cases, realisation of parental (or children's) preferences is vital because parental adaptation after a child's death is better when a child died at home and parents whose child died in the hospital reported higher ratings of depression (Goodenough, Drew, Higgins, & Trethewie, 2004; Lauer, Mulhern, Wallskog, & Camitta, 1983). However, lower home death rates for leukaemia patients may have resulted from the fact that this diagnostic group was more likely to die because of therapy-related complications, but not due to progression of the disease which hinders the timely transition to palliative care at home (Bradshaw, Hinds, Lansing, Gattuso, & Razzouk, 2005; Klopfenstein et al., 2001). In fact, it was shown that in cases of progressive cancer higher efforts were made to suggest home as the place of care and, if wanted, of death (Klopfenstein et al., 2001). Lastly, in our sample 53% of the children who received palliative care died at home. This home death rate is comparable to home death rates reported in other studies from Brazil with 59%, Australia with 61%, and England with around 40% (Gao et al., 2016; Heath et al., 2010; Kurashima et al., 2005).

Although burden of treatment is a currently emerging field, it is still lacking specific research as well as theoretical development (Mair & May, 2014; Sav et al., 2015). Our findings reflect antecedents of burden of treatment, namely treatment characteristics of children who died due to cancer. Being confronted with a higher burden of treatment, paediatric leukaemia patients and their families are particularly vulnerable. For example, more hospitalisations mean more interruption of daily life, longer hospitalisations lead to a higher likelihood of changes in relational networks and more absence from work or school. These effects, in turn, negatively affect both antecedents (e.g., support by a social network) and consequences of burden of treatment (e.g., quality of life, adherence). From this perspective, it can be argued that a high burden of treatment is associated with less favourable health care outcomes (May et al., 2009).
Burden of treatment theory argues that patients' ability to participate in the provided treatment, termed "agency", is dependent on social networks that support individual agents, termed "relationality" (May et al., 2014). Furthermore, the authors identify a group of persons, not the individual patient, as the adequate unit of analysis (May et al., 2014). When thinking about burden of treatment of paediatric cancer patients, both notions are particularly relevant because paediatric patients are highly dependent agents. They have to rely on their parents for mobility, finances, and participation in treatment-related decision-making. Additionally, the child's cancer disease becomes a life-changing experience for the whole family, calling for family to be the unit of analysis. A higher burden of treatment for children who died of leukaemia translates itself into a higher burden for the entire family unit. Therefore, healthcare professionals could aid in reducing the burden of treatment when they are better aware of the characteristics of leukaemia treatment and by constantly applying this awareness to the entire family.

4.2 | Limitations

This study has several limitations. First, the analysis of medical records is necessarily limited to both the available information in the records and to the quality of the information. Second, it is possible that the extracting research assistants may have overlooked relevant information. Both these factors may have contributed to missing values which, in turn, resulted in different sample sizes for some of the analyses. Researchers tried nevertheless to gather all relevant information by thoroughly extracting, and by asking the collaborating physicians for support. Third, since data collection took place at different centres, information in the records is not presented in a consistent manner which could have affected the extracted data. Fourth, medical records were written in French, German, and Italian and extracted in English. Accordingly, interextractor agreement with respect to linguistic nuances could be limited. However, researchers discussed a set of extractions and continued discussing throughout time of data collection. Fifth, our sample of deceased children is subject to a selection bias. However, we think that our results on number and duration of inpatient stays can be transferred to some extent to the sample of children with cancer who would survive.

Finally, retrospectively examining the duration and number of inpatient stays naturally does not capture the quality of these hospitalisations that could be indicated by the work of the psychosocial team, by the access to spiritual care or by the palliative approach within a hospital. Besides, exclusively focusing on the location of end-of-life care and of death does not obtain a complete picture of the quality of end-of-life care which requires considering additional factors such as the palliative concept of the respective ward, the parental preferences, demographic characteristics, or collaboration between inpatient and outpatient settings. Generally, more time spent in the hospital does not necessarily indicate lower quality of life for the child. On the contrary, in some cases hospitalisations may be experienced positively. For example, an inpatient setting can evoke a feeling of certainty on the part of the family, allows psychosocial and spiritual care, facilitates certain activities and therapies that are not available at home, or provides relief for caregiving parents.Capturing these indicators of quality of care and quality of life cannot be achieved by a retrospective analysis of medical records, but necessitates a prospective qualitative study which addresses the experiences of the patient and the family. Nonetheless, as shown above, current research seems to validate the view that inpatient stays represent burdensome experiences for the child and the family. Besides, it is self-evident that higher numbers of inpatient stays eo ipso lead to more disruptive effects on families’ daily lives with all consequences for social relationships, leisure activities, or psychological and physical well-being discussed above. Therefore, interpreting number and duration of inpatient stays as indicators (not sole determinants) of burden due to treatment is legitimate.

4.3 | Conclusion

Our findings reveal that deceased children with cancer and their families face a high burden of treatment. However, on average deceased paediatric leukaemia patients and their families are burdened by more and longer inpatient stays, by a higher proportion of inpatient stays, by spending more days in the hospital during the last month of the child's life, and by a higher likelihood of the hospital as the location of death. Their comparably good prognosis may be causing an unintentional underestimation of their burden of treatment. Healthcare professionals (in both inpatient and outpatient settings) who are involved in the treatment of this especially vulnerable patient group should, if possible, mitigate burden of treatment and shape treatment regimes in close collaboration with the family aiming for a minimum of disruption and of changed daily life. That is, the treating staff not only should keep treatment throughout the course of the illness (including end of life) on an effective and necessary minimum but also has to work towards understanding what kind of impact treatment and treatment-related aspects have on family's and children's daily lives (May et al., 2009). Indicating burden of treatment, our findings enable physicians and nurses to better grasp and understand what is imposed upon the patient and the family, for example, in terms of inpatient stays and accompanying factors. Finally, burden of treatment was analysed in this paper using objective variables extracted from medical records highlighting the disruptive effects of treatment that are likely to have a great impact on their daily life and that go beyond exclusively focusing on side effects on the part of the child as indicators of treatment burden. Thus, it emphasises the claim to think about burden of treatment from a family perspective.

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CONFLICT OF INTEREST
The authors declare that there is no conflict of interest.

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REFERENCES


European Association for Children in Hospital (2016). EACH Charter.


