An experience of multi-dimensional symptom assessment for children treated in a tertiary paediatric oncology unit: a prospective survey-based study

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Abstract

Background: Children undergoing cancer-directed treatment experience distressing symptoms. Multi-dimensional patient-reported symptom assessment scales have been validated in children with cancer, but are not routinely used in clinical practice.

Aim: To describe the symptom prevalence and burden for children receiving treatment in a paediatric oncology unit, as described by both children where possible, and their parents.

Methods: Prospective survey-based study during which the Memorial Symptom Assessment Scale was administered to children and parents. Participants were offered the opportunity to complete the survey on multiple occasions. Demographic and clinical data were obtained from electronic medical records.

Results: Forty-one children were recruited, aged 8 months to 18 years and 54% were female. In total, 54 parent surveys and 29 child surveys were completed. The vast majority of surveys (81%) were completed in the inpatient setting, and more than half within 10 days of chemotherapy. Haematological malignancies predominated. There was a median of 4.8 months between diagnosis and recruitment. Eleven children died after the study closed; no patients died during the study period. Symptom prevalence did not always correlate with distress.

Conclusions: Exploration of the impact of a symptom, and not just its presence, is vital for patient-centred care and can be achieved using multi-dimensional symptom scales. Both the child and caregiver's voices should be obtained where possible. Further studies are needed to explore how these scales can be used to identify distress and guide supportive care delivery.

Background

Although symptom self-report is generally considered gold standard, children's experiences have historically been assessed by proxy through parents, carers or clinicians, and only rarely through patient-reported outcomes[1]. Our understanding that children undergoing oncology disease-directed therapy, particularly those approaching end-of-life, suffer significant symptom burden and poor health-related quality of life predominantly comes from bereaved parents and/or clinicians in retrospective studies[2-4].

With a shift toward patient-reported outcomes, tools such as the Memorial Symptom Assessment Scale (MSAS) and Memorial Symptom Assessment Scale – Short Form (MSAS-SF) have been developed and validated[5,6]. The revised MSAS evaluates 32 physical and psychological symptoms, and has a high internal consistency for high prevalence and psychological symptoms (alpha coefficients of 0.88 and 0.83 respectively), and moderate internal consistency for low prevalence physical symptoms (alpha coefficient = 0.58)[5]. Importantly, the multi-dimensional nature of the MSAS augments information about the impact of a symptom as it seeks information about more than just the presence of a symptom, but also its frequency, severity and distress which enables clinicians to tailor their attention and treatment to the patient's most troubling symptoms[5]. These scales have now been adapted and used in children with cancer, including an 8-item version for children aged 7 to 12 years[7] and a 30 or 31-item version for children aged 10 to 18 years[8,9].

Patient-reported MSAS data support that children with cancer suffer from physical and psychological symptoms, including pain, lack of energy, nausea and feeling sad or nervous[1,7,8]. Symptoms may be related to underlying disease, interventions and/or treatments[10]. Multiple symptoms are usually experienced[1,7-9].

The PediQUEST study conducted across three centres in the USA is the largest paediatric study to use the MSAS. The MSAS was administered 549 times in teenagers and 249 times in children aged 7 to 12 years. In addition, a proxy version was completed 212 times by parents of children aged 2 to 6 years[1]. Pain (48%), fatigue (46%), drowsiness (39%) and irritability (37%) were the most prevalent symptoms, causing a high degree of distress. The study highlighted that symptom burden is present and distressing both during cancer-directed treatment and at end-of-life[1].

We sought to use the MSAS tools to explore the prevalence and, more importantly the impact of physical and psychological symptoms, for a cohort of children treated by the oncology unit in a tertiary Australasian hospital. We were interested in obtaining and comparing both parent and patient reports where possible.

Methods

The study was conducted in a tertiary paediatric hospital where the oncology unit provides care to children with haematological malignancies, as well as brain and solid tumours. The unit also performs bone marrow transplants for both malignant and non-malignant conditions. A prospective study was conducted between 31/05/2017 and 05/11/17. Parents and children were asked to complete symptom

surveys, and supplementary demographic and clinical data were collected from electronic medical records. Although the MSAS 7 – 12 form has only been validated in children aged 7 to 12 years, we included children as young as 5 years of age providing they were able to understand and answer the questions and complete the survey with parental assistance. The MSAS 10 – 18 was administered to children aged 10 – 18 years of age. A proxy version of the 31-item MSAS 10 – 18 was administered to parents, regardless of the age of their child. This form was selected as it enquires about more symptoms than the MSAS 7 – 12 form. All parents were invited to participate, regardless of whether their child was eligible or chose to participate.

Participants were identified using electronic medical record patient lists. Eligibility criteria were deliberately broad, in order not to exclude patients who may have symptom burden. Patients were eligible if they were being treated by the oncology department as an inpatient or outpatient, with a carer available to provide consent. Written and spoken English language were required. Participants were offered the option to complete the forms electronically or on paper. Once recruited, children and parents were offered the opportunity to complete the survey at a minimum of weekly intervals until the close of the study.

The MSAS survey forms were entered into REDCap©, a secure web-based database housed in the institution server[11]. For those who elected to complete surveys electronically, surveys were distributed electronically using a REDCap© link, with responses stored in the REDCap© database. Data from paper surveys were transcribed into the REDCap© database. Additional patient demographic and clinical data collected from the electronic medical records were entered and stored in REDCap©.

The study was not intended to influence standard care. However, given the potential for symptoms and distress to be unmasked, symptoms of concern were escalated to the oncology team who enacted referral to the pain, palliative care or psycho-oncology teams as needed.

Surveys were included if at least 25% of the survey was completed. Data were analysed in REDCap© and Excel, using descriptive statistics. Parent and child surveys were not matched, and data were summarised and presented separately for both groups.

Results

Patient demographic and clinical characteristics

Forty-one children of 172 receiving therapy over the period described were recruited; parents of all children and 25 children completed surveys (12 children aged 5 to 9 years, and 13 children aged 10 to 18 years). One child aged 5 years, and one child aged 6 years completed the MSAS 7 -12, with the remainder aged between 7 and 9 years. Most children and parents completed the survey just once, but eight parents completed it between two and four times, and four children completed it between two and three times. In total, 54 parent surveys, 14 MSAS 7 – 12 surveys and 15 MSAS 10 – 18 surveys were completed.

Most children had a malignant condition, while three were undergoing bone marrow transplant for an immunological condition. Most surveys were completed in the inpatient setting in the context of receiving disease-targeted and/or supportive treatments. More than half the surveys were completed within 10 days of chemotherapy administration. Haematological malignancies (leukemia or lymphoma) were represented more frequently than solid organ and brain tumours. The duration from diagnosis to recruitment ranged from several days to 6.5 years, with a median of 4.8 months. Eleven (27%) children died between 4 months and 3.3 years of being recruited to the study. No child died during the study period. Table 1 summarises the demographic, clinical and treatment details for patients.

	Number (%)
Age	
Range	8 months – 18 years
< 7 years	19 (46%)
7 – 9 years	8 (20%)
10 years and above	14 (34%)
Median	7.5 years
Gender	
Female	22 (54%)
Male	19 (46%)
Relationship of carer	
Mother	35 (85%)
Father	6 (15%)
Condition	
Haematological malignancy	22 (54%)
Solid malignancy	11 (27%)
Brain malignancy	5 (12%)
Non-malignant condition	3 (7%)
Chemotherapy in last 10 days (oral or intravenous)	33 (61%)
Radiotherapy in last 10 days	2 (4%)
Location of episode of care	
Inpatient	44 (81%)
Outpatient	10 (19%)
Admission reason if inpatient (n=44, more than one option possible)	
Diagnostic workup	5 (11%)
Planned disease directed therapy	26 (59%)
Chemotherapy	18 (69%)
Radiotherapy	1 (4%)
Bone marrow transplant	11 (42%)
Supportive care	34 (77%)
Febrile neutropenia	19 (56%)
Infection	9 (26%)
Nutritional support	9 (26%)
Mucositis	6 (18%)
Pain	7 (21%)
End of life care	0 (0%)
Teams involved during episode of care (n=54)	
Pain team	7 (13%)
Palliative care team	9 (17%)
Psycho-oncology team	6 (11%)
Status at time of write up	
Alive	30 (73%)
Deceased	11 (27%)
Time between enrolment and death	4 months – 3.3 years
Average time between enrolment and death	18 months

Table 1. Demographic, clinical and treatment contexts

Symptom prevalence and burden

On the 8-item MSAS 7 – 12 form, children reported a mean of 5 symptoms (standard deviation (SD) = 2.0). On the 31-item MSAS 10 – 18 form, children reported a mean of 18 (SD = 3.7) symptoms. On the proxy MSAS 10 – 18 form, parents reported a mean of 15 (SD = 5.4) symptoms experienced by their child.

Tables 2 and 3 summarise child self-reports and parent proxy-reports of symptom prevalence, frequency, severity and distress. Figure 1 illustrates the degree of distress from each symptom, with responses of 'quite a bit' or 'very much' to the question *'How much did it bother or distress them/you?'* considered high distress.

Change in appetite (n=25, 86%), nausea (n=23, 79%) and pain (n=23, 79%) were the most prevalent symptoms reported by children. Lack of energy (n=15, 100%), hair loss (n=12, 80%) and change in self-image (n=11, 73%) were the most prevalent among children aged 10 – 18 years (noting that these symptoms are not included on the MSAS 7 – 12 form). Psychological symptoms were reported in more than half of the child completed surveys, including worrying (n=19, 66%) and sadness (n=15, 52%). Most prevalent symptoms reported by parents included lack of energy (n=49, 91%), pain (n=48, 89%), nausea (n=44, 81%) and lack of appetite (n=43, 80%).

Prevalence did not always correlate with symptom frequency, severity or distress. For example, all children aged 10 – 18 years experienced lack of energy, while only 4 (27%) found it distressing. In addition, while only 14 (26%) children whose parents reported difficulty swallowing, if present this caused them high distress (n=8, 57%). Younger children were less likely to report distress from symptoms compared with older children and parents.

Symptom	Prevalence n (%)	High frequency* (if present) n (%)	High severity** (if present) n (%)	High distress*** (if present) n (%)
Symptoms included on both MSAS 7 – 12 and MSAS 10 – 18 (n = 29)				
Change/lack of appetite	25 (86%)	19 (76%)	-	4 (16%)
Nausea	23 (79%)	5 (22%)	-	3 (13%)
Pain	23 (79%)	11 (48%)	13 (57%)	10 (43%)
Tired/drowsy	20 (69%)	10 (50%)	7 (35%)	2 (10%)
Worrying	19 (66%)	5 (26%)	5 (26%)	4 (21%)
Difficulty sleeping	16 (55%)	-	-	2 (13%)
Sadness	15 (52%)	5 (33%)	5 (33%)	5 (33%)
Itch	9 (31%)	2 (22%)	1 (11%)	2 (22%)
Symptoms included only on the MSAS 10 – 18 (n = 15)				
Lack of energy	15 (100%)	10 (67%)	6 (40%)	4 (27%)
Hair loss	12 (80%)	-	7 (58%)	2 (17%)
“I don’t look like myself”	11 (73%)	-	6 (55%)	6 (55%)
Feeling irritable	10 (67%)	5 (50%)	3 (30%)	2 (20%)
Headache	10 (67%)	2 (20%)	4 (40%)	2 (20%)
Altered taste	10 (67%)		4 (40%)	3 (30%)
Difficulty concentrating	9 (60%)	3 (33%)	2 (22%)	1 (11%)
Dry mouth	9 (60%)	4 (44%)	4 (44%)	3 (33%)
Difficulty swallowing	9 (60%)	6 (67%)	4 (44%)	5 (56%)
Mouth sores	8 (53%)	-	5 (63%)	4 (50%)
Weight loss	8 (53%)	-	3 (38%)	1 (13%)
Constipation	8 (53%)	-	2 (25%)	2 (25%)
Changes in skin	8 (53%)	-	2 (25%)	1 (13%)
Feeling nervous	7 (47%)	2 (29%)	1 (14%)	2 (29%)
Diarrhoea	7 (47%)	2 (29%)	4 (57%)	3 (43%)
Vomiting	6 (40%)	2 (33%)	2 (33%)	3 (50%)
Shortness of breath	6 (40%)	0 (0%)	1 (17%)	2 (33%)
Sweats	6 (40%)	3 (50%)	1 (17%)	1 (17%)
Swelling of arms/legs	6 (40%)	-	3 (50%)	2 (33%)
Dizziness	6 (40%)	1 (17%)	2 (33%)	2 (33%)
Numbness/tingling in hands/feet	4 (27%)	2 (50%)	1 (25%)	0 (0%)
Problems with urination/peeing	3 (20%)	1 (33%)	0 (0%)	0 (0%)
Cough	2 (13%)	0 (0%)	0 (0%)	0 (0%)

Table 2. Child self-reports of symptom prevalence and associated severity, frequency, and distress if present

(*‘a lot/ almost always’ **‘severe/ very severe’ ***‘quite a bit/very much’)

Symptom	Prevalence n (%)	High frequency* (if present) n (%)	High severity** (if present) n (%)	High distress*** (if present) n (%)
Lack of energy	49 (91%)	33 (67%)	16 (33%)	11 (22%)
Pain	48 (89%)	20 (42%)	12 (25%)	23 (48%)
Nausea	44 (81%)	17 (39%)	8 (18%)	13 (30%)
Lack of appetite	43 (80%)	35 (81%)	17 (40%)	5 (12%)
Feeling irritable	42 (78%)	16 (38%)	6 (14%)	7 (17%)
Feeling drowsy	37 (69%)	17 (46%)	10 (27%)	3 (8%)
Altered taste	32 (59%)	-	14 (44%)	11 (34%)
Difficulty concentrating	32 (59%)	15 (47%)	6 (19%)	2 (6%)
Sadness	32 (59%)	8 (25%)	6 (19%)	9 (28%)
Feeling nervous	30 (56%)	6 (20%)	6 (20%)	6 (20%)
Diarrhoea	29 (54%)	12 (41%)	8 (28%)	5 (17%)
Difficulty sleeping	29 (54%)	9 (31%)	5 (17%)	5 (17%)
Vomiting	29 (54%)	10 (34%)	3 (10%)	7 (24%)
Weight loss	28 (52%)	-	5 (18%)	1 (4%)
Hair loss	27 (50%)	-	12 (44%)	6 (22%)
Cough	27 (50%)	6 (22%)	4 (15%)	3 (11%)
Dry mouth	26 (48%)	13 (50%)	5 (19%)	6 (23%)
Changes in skin	25 (46%)	-	7 (28%)	4 (16%)
Worrying	25 (46%)	4 (16%)	2 (8%)	4 (16%)
Shortness of breath	22 (41%)	5 (23%)	4 (18%)	5 (23%)
Sweats	22 (41%)	8 (36%)	3 (14%)	1 (5%)
Mouth sores	19 (35%)	-	8 (42%)	11 (58%)
Headache	18 (33%)	8 (44%)	7 (39%)	8 (44%)
Itch	18 (33%)	3 (17%)	5 (28%)	6 (33%)
Constipation	15 (28%)	-	6 (40%)	6 (40%)
Numbness/tingling in hands/feet	15 (28%)	4 (27%)	4 (27%)	4 (27%)
Difficulty swallowing	14 (26%)	8 (57%)	7 (50%)	8 (57%)
Swelling of arms/legs	12 (22%)	-	3 (25%)	2 (17%)
“I don’t look like myself”	11 (20%)	-	4 (36%)	4 (36%)
Dizziness	10 (19%)	1 (10%)	2 (20%)	1 (10%)
Problems with urination/peeing	6 (11%)	1 (17%)	2 (33%)	2 (33%)

Table 3. Parent proxy-reports of symptom prevalence and associated severity, frequency, and distress if present (n=54)

(*‘a lot/ almost always’ **‘severe/ very severe’ ***‘quite a bit/very much’)

Discussion

Our findings are consistent with existing literature that children undergoing oncological treatment experience a high degree of suffering, related to several symptoms at any given time[1,7,8]. These symptoms are both physical and psychological, and can cause a high degree of distress.

We included children regardless of the timepoint in their diagnosis and treatment trajectory. Our inclusion criteria varied from other studies as we recruited children undergoing bone marrow transplantation for non-malignant conditions and children younger than 7 years if they were deemed able to understand and

respond to the MSAS 7 – 12 form. The rationale for this was our hypothesis that neither of these groups are immune from suffering and both can express this suffering. We acknowledge that the MSAS 7 – 12 has not been validated in children younger than 7, however the younger children in our study appeared capable and keen to participate. While our numbers are too small to compare subgroups, we would support including both these groups in future studies.

Prevalence of some symptoms was higher in our study than that reported by others who have also explored symptoms for children with cancer who are not just at end of life[1,7,8]. For example, pain was reported by 79% of children and 89% of parents in our study, compared to 48% in the PediQUEST study[1], 32% in the MSAS 7 – 12 validation study[7], and 49% in the MSAS 10 – 18 study[8].

The higher prevalence of symptoms in our study is likely related to the higher proportion of inpatient survey completion (81% in our study versus 11% in the PediQUEST study[1]). In our study, 61% of children had received chemotherapy in the preceding 10 days, a factor associated with a higher symptom burden in the PediQUEST study[1]. In addition, more intensive therapies due to the inclusion of children early in their cancer treatment course and a higher proportion of children with haematological malignancies, are likely to have contributed to higher symptom burden and report. The higher symptom burden among inpatients is mirrored in the MSAS 10 – 18 study where symptom prevalence for inpatients was 12.7 (SD = 4.9) compared with 6.5 (SD = 5.7) for outpatients[8].

Parent and child reports of symptom presence and distress were usually consistent in our study. For example, sadness was reported in 52% of child surveys and 59% of adult surveys. When present, sadness caused high distress 33% and 28% of the time according to child and parent reports respectively. Similarly, pain was reported in 79% and 89% of child and parent surveys respectively, with resulting high distress 43% and 48% of the time when present. Parent and child reports of distress did not always correlate however, for example, children seemed more distressed by vomiting and dizziness, and less distressed by headaches than parents may have recognised. This speaks to the importance of obtaining and hearing the child's voice, and not solely relying on proxy reports.

Our study supports the importance of multi-dimensional symptom assessment, a conclusion made by Portenoy et al. in their validation studies. Unlike the PediQUEST study findings that when a symptom was present it usually caused high distress[1], in our study the presence of a symptom didn't necessarily correlate with distress. Symptoms may have been present with high frequency but little distress therefore

requiring little clinical attention; conversely, infrequent symptoms such as dysphagia may have caused disproportionately high distress and warranted aggressive proactive symptom management.

We propose that it is crucial to reflect on how we assess, consider and use the four dimensions of the MSAS for a given child. It is possible that untreated frequent or severe symptoms may over time lead to more distress on subsequent assessment, causing disproportionate negative impact on quality of life in these vulnerable patients that could be ameliorated with a more active expectant approach. Future studies could focus on how multi-dimensional symptom assessment tools might identify predictors of distress, which could in turn guide intensity of symptom control or promote protocols for timely referral to supportive care teams.

Ultimately, patient-centred care requires exploration of the patient's voice and agenda. Knowledge that a symptom is present is less useful than understanding its impact, and this is the very reason for the development of multi-dimensional symptom assessment scales such as the MSAS versions. Understanding the degree and source of distress in a patient's own words can guide symptom management so that time and resources are invested in a way that optimally addresses patients' priorities.

Strengths and Limitations

The numbers in our study are low, and don't allow comparison across subgroups like disease type and episode of care setting. Unfortunately, we did not collect data about the incidence of distress being escalated to the oncology team, but this would have been useful and should be included in future studies. Ultimately, the prospective design, and inclusion of both the children and parent voices are strengths of the study, and our findings contribute to emerging literature that includes the child's voice. In addition, the high proportion of inpatients in our study complements and adds to existing literature which has predominantly been based in the outpatient setting.

Conclusion

Our study supports the value and importance of multi-dimensional symptom assessment. It is not simply enough to know whether a symptom is present, but rather its impact. This cannot be presumed by clinicians. Tools such as the MSAS can be used to obtain self-reports from children, and these can be complemented by parent reports. Future studies are needed to explore how child-friendly multi-dimensional symptom assessment tools may enhance child-centred care, identify distress and guide care delivery.

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Declarations

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Conflicts of Interest:

The authors have no conflicts of interest to declare.

Availability of data and material:

Data available on request from the corresponding author.

Code availability:

Not applicable.

Authors' contributions:

NTK, JH, BHS and MW contributed to the study conception and design. Data collection and analysis, and the first draft of the manuscript were performed by NTK. All authors contributed to and commented on the subsequent versions, and read and approved the final manuscript.

Ethics approval:

Institutional ethics approval was granted (HREC37022A).

Consent to participate:

Freely-given, written informed consent to participate in the study was obtained from parents.

Consent for publications:

Not applicable.

Figures

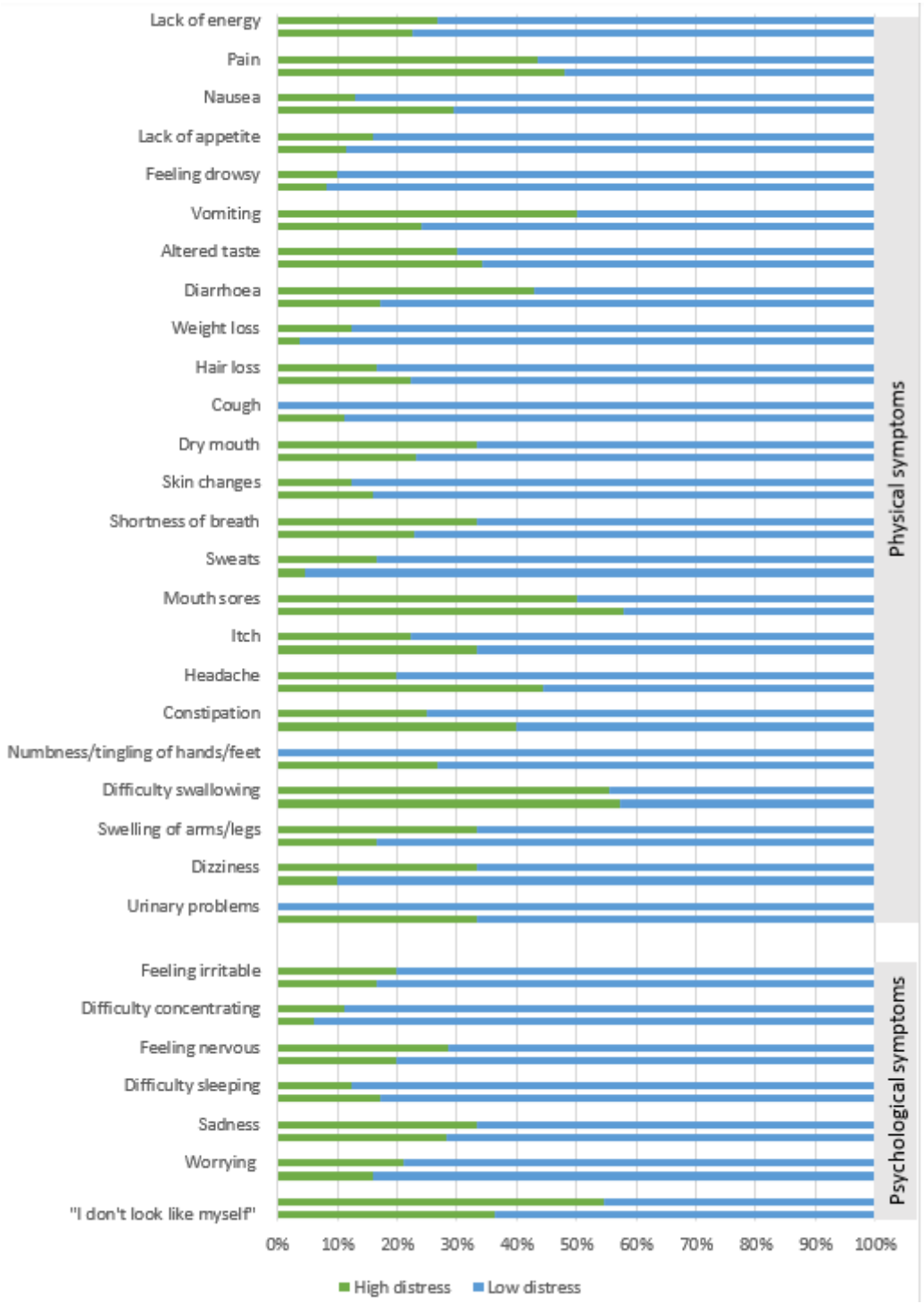

Figure 1

Degree of distress. For each symptom, the top bar represents self-report by children, and the bottom bar represents proxy report by parents.