

Withdrawal of Treatment in Pediatric Intensive Care Unit at a Children's Hospital of China: a Period of 10 Years Retrospective Study

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Abstract

Background: Published data and practice recommendations on end-of-life generally reflect Western practice frameworks, there are few reports that refer to withdrawing treatment of children in China.

Methods: Withdrawing treatment and reasons of children in the pediatric intensive care unit (PICU) of a regional children's hospital in eastern China from 2006 to 2017 was studied retrospectively. Withdrawing treatment was divided into medical withdrawing and premature withdrawing as defined.

Results: The incidence of withdrawing treatment among children in the PICU decreased significantly, for premature withdrawing from a 3-year average of 15.1% in 2006–2008 to 1.9% in 2015–2017 (87.4% reduction). Overall incidence of withdrawal of care reduced over the time period, and withdrawal of therapy by guardians was the main contributor to the overall reduction. The median age of children in whom treatment was withdrawn increased from 14.5 (interquartile range: 4.0–72.0) months in 2006 to 40.5 (interquartile range: 8.0– 99.0) months in 2017. Reasons given by guardians of children whose treatments were withdrawn in 2011–2017, “illness is too severe” ranked first, accounting for 66.3%, followed by “condition has been improved” (20.9%). Only a few of the guardians ascribed withdrawing treatment to economic reasons.

Conclusions: The decreasing in incidence of premature withdrawing suggests that guardians are more willing to actively treat their children in this children's hospital during the last years. Chinese children's guardians have their own unique ways of expression when self-reported reasons for withdrawing treatment.

Background

It is an inevitable dilemma for parents and physicians to withdraw treatment in critically ill children. Published data and practice recommendations on end-of-life generally reflect Western practice frameworks [1,2]. In regions with different social cultures, religions, ethnicities, health care levels, and economic development, people often have different attitudes toward withdrawal of treatment. Even in the same region, there are controversial opinions regarding withdrawing treatment [1,3,4]. China has the largest number of children in the world, with 220 million children aged 0–14 years [5]. The Chinese government implemented the Children's Development Program of China (2011–2020) in 2011 with the aim to reduce the mortality of infants and under 5 mortality rate (U5MR) to < 10 ‰ and 13‰, respectively [6]. Five years after implementation of the program, the interim statistical monitoring report showed that the infant mortality rate and the U5MR were reduced by 5‰ and 5.7‰ compared to 2010, respectively [7]. However, the report did not provide the statistical data pertaining to withdrawing treatment in critically ill children, which would have contributed to infant mortality and U5MR.

There is limited data on withdrawing treatment in pediatric intensive care units (PICU) of China. It was recently reported that deaths of children whose treatment were withdrawn accounted for 68.3% of the total deaths and 7.8% of the total hospitalizations of PICU at a tertiary hospital in China [8]. Inpatient self-

discharge was common in China before, a cross sectional nationwide study in China including children and adults showed that the proportion of inpatient self-discharge reached 43% in 2003, although it fell to 30% in 2011 [9]. The self-discharge rate of hospitalized children in general pediatrics at an affiliated hospital of university in Henan Province of China from 2011 to 2012 was 18.7% [10]. In a tertiary children's Hospital in Australia, the rate of self-discharge was far lower than that was reported above in China, which was 1.4% between 2011 and 2015 [11]. Rates of self-discharge among pediatric patients in Africa and the Middle East ranging from 1.5% to over 6% [11], were also very different from China. The self-discharge rate of children in China may be substantially different from that in other places, but this difference is largely due to the different definitions of self-discharge in the research from China and other places. Many researches out of China defined inpatient who discharge against medical advice (DAMA) as self-discharge. For example, children transferred to another hospital was considered as non-DAMA in Sealy's research, but considered as self-discharge in Zhao's research [10, 11].

There is currently no relevant legislative provision in China for withdrawing treatment [12]. Due to the special relationship between physicians and patients and the lack of related laws, whether or not to withdraw treatment is often decided by the child's guardians, although these decisions may not be in the best interest of the child. Key decisions may include whether or not to use antibiotics in the instance of life-threatening infections and cardiopulmonary resuscitation in the event of cardiac arrest or to escalate to emergency or intensive care settings if the child becomes unstable [13]. In the past few decades, economic, healthcare, and social conditions in China have changed significantly. To better understand withdrawal of treatment in China, we report the associated data at a regional children's hospital in eastern China during the last years.

Methods

1 Study subjects

The study was approved by the hospital ethics committee. All children were studied following written informed consent given by their parents. The study included pediatric patients who were admitted to the PICU of the Children's Hospital of Soochow University from 2006 to 2017. The hospital is the only tertiary and class-A hospital in Suzhou and the major hospital to admit and treat critically ill children in the region. The inclusion criteria included the following: (1) met PICU admission standards and treated in the PICU; and (2) children whose treatments were withdrawn. The exclusion criteria were as follows: (1) admission to the PICU, but subsequently transferred to the general wards or departments; (2) > 14 years of age; (3) in a near-death state and treatment was abandoned at the time of admission; and (4) children with brain death.

2 Definition of withdrawing treatment

Withdrawing treatment was divided into two categories, defined as follows: (1) medical withdrawing: the child was in a permanent, irreversible coma or inevitable dying condition, and treatment in a child for whom pursuing treatment was futile, and the guardian requested the medical staff to limit or withdraw

life-sustaining treatment; (2) premature withdrawing: also was defined as treatment abandonment, guardian refusal for active treatment of a severely ill child for which treatment was indicated or for which there was some chance of survival, including the following situation, (a) the guardian elected to withdraw care and took the child from the hospital against medical advice, (b) the child was still severely ill and the guardian did not authorize or ask the doctor to cease the treatment that was expected to improve the prognosis. The patient's condition and prognosis were based on the clinical judgment of the medical team.

3 Data collection and reporting of reasons for withdrawing

The age, gender, place of residence, type of disease, length of stay in the PICU, and condition at the time of discharge were collected from the hospital database (data for 2013 and 2014 were not available). Data on the condition of the child and the withdrawn treatment were collected from the "informed consent" and "doctor-patient conversation record" documents. These documents were formed during hospitalization at the situation of that the child's condition was serious, worsens, and when she or he needs special treatment or examination, requires expensive treatment, etc. The guardian's self-reported reason for abandoning the child's treatment were recorded since 2011.

4 Statistical analyses

Age and days in ICU are expressed as the median and interquartile range (IQR). A Wilcoxon two-sample test was used for comparison of age and days in ICU between two groups. Categorical variables are expressed as a frequency (%), and a chi-square test or Fisher exact test was used for inter-group comparisons. A trend test was used for analyzing the change in the incidence of withdrawing treatment across time from 2007 to 2017. SAS 9.3 was used for data processing and statistical analyses. All tests were two-tailed and a $p < 0.05$ was considered statistically significant.

Results

1 General characteristics of the children and incidence of withdrawal of treatment

From 2006 to 2017 (excluding 2013 and 2014), a total of 8006 children were admitted to the PICU; treatments were withdrawn in 680 children, including medical withdrawing in 174 children and premature withdrawing in 506 children. The general characteristics of children whose treatment was withdrawn are shown in Table 1. The age of children who experienced medical withdrawing was significantly higher than those who experienced premature withdrawing (median: 24 vs. 8 months, $p < 0.001$). There was significant difference in primary disease between children who experienced premature withdrawing and medical withdrawing (infectious proportion: 20.7 vs. 35.6%, $p < 0.001$).

The year-incidence curve is shown in Figure 1A. The highest incidence of total withdrawing treatment (24.3%) and the highest incidence of premature withdrawing (20.6%) occurred in 2007. The incidence of total withdrawing treatment and premature withdrawing followed a year-by-year decreasing trend from

2007 to 2017 ($p < 0.001$). Incidence of total withdrawing treatment dropped from its highest point (24.3%) in 2007 to its lowest point (2.6%) in 2017, the 3-year average incidence dropped from 17.5% in 2006–2008 to 4.0% in 2015–2017 (a 77.1% reduction). The 3-year average incidence of premature withdrawing dropped from 15.1% in 2006–2008 to 1.9% in 2015–2017 (a 87.4% reduction). There was no significant change in the incidence of medical withdrawing, which was 2.4% in 2006–2008 and 2.1% in 2015–2017. The proportion of premature withdrawing in all children whose treatment was withdrawn declined from 88.0% in 2006 to 43.5% in 2017 (Figure 1B). The decrease in cases of premature withdrawing contributed most of the decrease in total withdrawing.

The median age of children is shown in Figure 2. There was a downward trend in the median age of all children before 2009, but this increased significantly each year from 2009; the median age increased from 4.0 months (IQR: 2–24) in 2009 to 40.5 months (IQR: 8–99) in 2017. The children who experienced medical withdrawing had a higher age increasing than those who experienced premature withdrawing.

2 Reasons given by guardians for withdrawing treatment and condition of children at the time of discharge.

Reasons given by guardians for withdrawing treatment are shown in Table 2. Among the 326 children whose treatments were withdrawn in 2011–2017, “illness is too severe” ranked first, accounting for 66.3%, followed by “condition has been improved” (20.9%). Almost all guardians (96.1%) of children who experienced medical withdrawing self-reported reason as “illness is too severe”, a few guardians (3.9%) self-reported reason as “condition has been improved”. For guardians of children who experienced premature withdrawing, these two reasons account for 46.7% and 32.0%, respectively. Of all guardians of children who experienced premature withdrawing, 7 (3.5%) guardians self-reported “economic reason”, one (0.5%) guardians self-reported “unclear diagnosis”.

Among the 326 children whose treatments were withdrawn in 2011–2017, there were 132 (40.5%) children who died following discharge, of which 98 deaths were classed as medical withdrawing and 34 deaths were premature withdrawing (mortality rate: 76.0 vs 17.3%, $p < 0.001$).

3 Treatment modalities that were withdrawn

The life-sustaining treatment modalities that were withdrawn are shown in Table 3. The most frequent modalities withdrawn were intravenous, ventilation and intubation. In 24% of cases, all three treatment modalities were withdrawn.

Discussion

Withdrawing treatment is not only a medical ethical issue, but a social issue. There has been considerable debate about how to implement withdrawal of treatment. Some scholars in China believe that withdrawal of treatment in ICUs should follow the principle of benefit and respect the patient's willingness and fairness principle [14]. People also believe that decisions on withholding/withdrawing

treatment need to take account of the likely success, benefits, burdens and risks of treatment, as well as the patient's presumed wishes [4]. Ethicists believe that the best interest standard provides insufficient guidance for decision-making regarding children and does not reflect the actual standard used by medical providers and courts; harm principle provides a more appropriate threshold for state intervention than the best interest standard [15]. For children, however, withdrawing treatment is decided by their guardian(s) in China, as children do not have full legal capacity, and guardians' decisions are not always in the best interest of the child. Therefore, in this study we classified cases of withdrawing treatment into two categories: children who were unlikely to survive and whose treatment was withdrawn and children for whom a treatment was indicated but whose guardian(s) chose to abandon treatment.

For the treatment of children with severe illness in China, the general practice of physicians is to have a conversation with the child's guardian, introduce the child's condition to the guardian, provide medical advice, and discuss treatment methods and prognosis, after which the guardians are asked to make a decision. In many cases, even if a child has a chance to survive, their guardians choose to abandon treatment. When this happens, although the medical staffs will try their best to persuade the guardian do not give up, or even help the guardian to solve some difficulties. But unfortunately, there will always be some unexpected disputes, and medical staffs even face the risk of legal liability. Therefore, in general, the medical staff have to comply with the requirements of the guardian. When patients cannot articulate their wishes in American hospitals, it has been reported that ICU physicians and nurses usually leave final decisions in the hands of the families [16]. Despite extensive experience with critically ill patients and the availability of prognostic scoring systems, prognostication generally remains imprecise in the ICU, physicians won't say in absolute terms whether a child will die or whether they will experience poor functional outcomes [17], and fear of litigation is a major barrier to properly informing a child's guardians in Greece [18]. Physicians in China experience similar restraints, which may damage communications and cause resentment. There are some official guidelines for withholding and withdrawing therapy for critically ill patients in some countries and regions [1,19–23]. Scholars believe that several key ethical concepts play a foundational role in guiding end-of-life care, including the distinctions between withholding and withdrawing treatments, between actions of killing and allowing to die, and between consequences that are intended vs. those that are merely foreseen [24]. There's no legal procedure and official guidelines for withdrawing treatment in China. In China, especially in the past decade, tension and deterioration of the doctor-patient relationship was increasing, there have been many disputes and contradictions between doctors and patients caused by patients' treatment choice, and even some medical staffs have suffered injuries from radical patients or patients' families. For instance, on October 3, 2016, a pediatrician in Shandong Province was killed by the father of a girl he had treated, and on December 24, 2019, a Beijing emergency physician was killed by a family member of a 95 year old patient with advanced cancer. In such a situation, in order to avoid the troubles caused by medical disputes, doctors will use more obscure technical terms to accurately describe patients' conditions in the process of communication between doctors and patients, although these technical terms may not be fully understood by patients and their families. For the prognosis evaluation and treatment of severe patients, doctors will become more conservative when discussing with patients or their families,

especially in importunate patients or their families. This makes it difficult for this subset of patients to obtain more active treatment opinions from doctors.

From the results presented in this study— over the past decade in the PICU, there has been a decrease in incidence of withdrawing treatment, which was mainly contributed by the decline premature withdrawing—suggests that guardians are more willing to actively treat their children. The increase in the age of children whose treatment was withdrawn also helps to suggest that guardians are more active in treating their children; although this increase may be due to the increase in the age of total children admitted to PICU. It has been reported that guardians withholding or withdrawing intensive care for extremely preterm infants at the limits of viability has become more acceptable than it was 20 years ago in Germany, Switzerland, and Austria [25]. The frequency of PICU patients who undergo the process of withholding or withdrawing life-sustaining treatment was 1.5% in Chile from 2004 to 2014 [26]. The medical withdrawing defined in our study is equivalent to the withdrawing life-sustaining treatment mentioned in the above literature. Compared with other countries and regions, the incidence of withdrawing life-sustaining treatment shown in our study recent years was moderate. The premature withdrawing children defined in this study were mainly composed of children who discharge against medical advice (also known as self-discharge). Therefore, we speculate that the rate of self-discharge of PICU in our hospital in 2015–2017 was close to that reported in Australian PICU [11]. Decisions on end-of-life care in neonates shifted from active resuscitation to non-active resuscitation in Korea between 2001 and 2015 [27]. In contrast, the proportion of non-active resuscitation for critically ill children in China is declining. There are several possible reasons for the change in the attitude of the guardians of critically ill children toward withdrawing treatment, including economic changes, improvement of medical technology, higher education of parents, reduction of discrimination against girls, etc. The economic status of children's families has improved and health insurance covers more residents over the past decade [9], and therefore, families are more capable of paying medical expenses. It is interesting to note that a short economic crisis broke out in China between 2007 and 2008, and the incidence of withdrawing treatment especially premature withdrawing reached a peak in 2007. Indeed, economic factors are key in deciding whether or not to abandon treatment [28]. Other studies have also shown that per capita GDP has a high negative correlation with infant mortality in China [29]. The proportion of people with higher education doubled between 2006 and 2017 in china [30], it was reported that low father's level of education was associated with discharge against medical advice in Iran [31].

In this study, more than one-half of the guardians stated that their reason for withdrawing treatment was that the child's condition was too severe. Only a few of the guardians ascribed withdrawing treatment to economic reasons, which is inconsistent with another study in which economic reasons accounted for one-half of the total [8,32]. This difference may be due to variations in the study method. Our medical documents only recorded guardians' self-reported reasons for treatment withdrawal, which may have introduced a bias. Children at the time of withdrawal of treatment had lower disease severity than at admission [32], and one in five guardians cited "condition has been improved" as a reason for withdrawing in this study, of most these guardians were guardians of children who experienced premature withdrawing. We suggest that this was not representative of the true reason for withdrawing

treatment, guardians may have moderated their statements to alleviate their guilt. Under the influence of Chinese Confucian culture, guardians are used to the expression of compromise. When the guardian was asked to report the reasons for abandonment, he / she shall state the apparent objective phenomenon instead of the real reason. We believe that the main reasons for premature abandonment may be related to economic status, poor and uncertainty of prognosis, research data from Changsha of China also showed that these reasons are the main reasons [8]. Although China has established a basic medical insurance system covering almost all residents in the past decade [9], the coverage of children's serious illness insurance is not perfect, proportion and amount of out of pocket medical care for serious illness are still high,, and continuing treatment will incur a heavy economic burden. We observed another phenomenon that premature abandonment was rare in children raised in social welfare institutes, in large part because the treatment expenses of such children are ensured by the government. When the prognosis of the treatment is poor or uncertain, especially for those whose treatment cost a lot of money but still may be not survival, guardians that short of money are more likely to give up the treatment. Although sometimes doctors definitely tell the guardian that the child can survive after treatment, some guardians are afraid that the serious sequelae of the child will affect the quality of life of the family and then decide to give up. This choice tendency of guardians can also be seen in children at social welfare institutes in China, most of the children are abandoned by their parents because of congenital diseases.

Although death practices are changing in China, the idea of a death occurring at home or in the person's hometown, in the main hall in the presence of ancestor tablets is still cherished [3]. This may be one of the factors affecting the guardian's decision. The low proportion of deaths in hospital of children whose treatment was withdrawn prematurely and the fact that some children experiencing medical withdrawing survived when discharged from hospital may be influenced by the death culture in China. The mortality rate of children in our study following withdrawal of life-sustaining was significantly lower than that in PICU of Australia [33]. This is because some children in our study retained limited maintenance measures (e.g. AMBU) after most of their life-sustaining were removed, and then leave the hospital immediately to let the death happen at home / hometown. Similar practices can be observed elsewhere: home deaths for critically ill babies/children does occur in the UK, although infrequently [34]. When interpreting the results from this study, some limitations should be considered. This was a single center retrospective study. The region where the hospital is located is undergoing rapid urbanization, and is an economically developed region in China. The results of this study are not representative of all of China. The impact of culture, healthcare insurance status, religion and education on the withdrawal of treatment has not been studied.

Conclusions

The decreasing in incidence of premature withdrawing suggests that guardians are more willing to actively treat their children in this children's hospital during the last years. Chinese children's guardians have their own unique ways of expression when self-reported reasons for withdrawing treatment.

Declarations

1) Ethics approval and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the Children's Hospital of Soochow University and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. All participants were enrolled following written informed consent given by their parents and the permission to access patient data was obtained from the health facility. Data on the condition of the child and the withdrawn treatment were collected from the informed consent form and the doctor-patient records. These documents also recorded the guardian's self-reported reason for abandoning the child's treatment since 2011. The use of this data was approved by the ethics committee.

2) Consent for publication

Not applicable.

3) Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author (Shuiyan Wu) on reasonable request

4) Competing interests

The authors declare that they have no conflict of interest.

5) Funding

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6) Authors' contributions

HQ L: Analyzed the data and drafted the manuscript; DN S: Collected clinical data and participated in analyzing the part of data; XB G and YH D: Collected clinical data; QJ Z: Participated in communicating with patients' guardians; ZJ B, XQ D and YL: Participated in the discussion and interpretation of the data and results; assessed clinical prognoses of patients; SY W: Designed the research, involved in the critical revision of this manuscript and participated in the discussion and interpretation of the data and results; assessed clinical prognoses of patients. All authors have read and approved the manuscript.all authors have read and approved the manuscriptall authors have read and approved the manuscript all authors have read and approved the manuscript

7) Acknowledgements

Not applicable.

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Abbreviations

PICU, pediatric intensive care unit;

U5MR, under 5 mortality rate;

DAMA, discharge against medical advice;

IQR, interquartile range.

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Tables

Table 1. Characteristic of children whose treatment was withdrawn

Variables	Total, n=680	Medical withdrawing, n=174	Premature withdrawing, n=506	p*
Age*, (month)				<0.001
Median(IRQ)	12.0 (3.0, 48.0)	24.0 (8.0,73.0)	8.00 (3.0,36.0)	
Days in ICU				0.695
Median(IRQ)	2.0 (1.0,7.0)	3.00 (1.0,8.0)	2.00 (1.00,6.0)	
Gender, n(%)				0.380
Boy	395 (58.1)	106 (26.8)	289 (73.2)	
Girl	285 (41.9)	68 (23.9)	217 (76.1)	
Residence, n(%)				<0.001
Countryside	93 (13.7)	19 (10.9)	74 (14.6)	
Town	244 (35.9)	63 (36.2)	181 (35.8)	
Urban	182 (26.8)	68 (39.1)	114 (22.5)	
Unknown	161(23.7)	24 (13.8)	137 (27.1)	
Primary disease, n(%)				<0.001
Non-infectious	464 (68.2)	138 (79.3)	326 (64.4)	
Infectious	216 (31.8)	36 (20.7)	180 (35.6)	

* p value for medical withdrawing vs. premature withdrawing.

Table 2 Reasons given by guardians for withdrawing treatment

Reasons	Total, n=326, (%)	Medical withdrawing, n=129,(%)	Premature withdrawing, n=197,(%)	p*
Illness is too severe	216 (66.3)	124 (96.1)	92 (46.7)	<0.001
Condition has been improved	68 (20.9)	5 (3.9)	63 (32.0)	
Economic reason	7 (2.1)	0 (0.0)	7 (3.5)	
Unclear diagnosis	1 (0.3)	0 (0.0)	1 (0.5)	
Unstated reason	34 (10.4)	0 (0.0)	34 (17.3)	

* p value for medical withdrawing vs. premature withdrawing.

Table 3. Treatments that were in place and then withdrawn from children

Treatments	Total, n=680, (%)	Medical withdrawing, n=174,(%)	Premature withdrawing, n=506,(%)	p*
Intravenous	437 (64.3)	103 (59.2)	334 (66.0)	0.106
Ventilation	279 (41.0)	105 (60.3)	174 (34.4)	<0.001
Intubation	277 (40.7)	103 (59.2)	174 (34.4)	<0.001
Antimicrobial therapy	113 (16.6)	19 (10.9)	94 (18.6)	0.019
Inotropic and vasopressors	70 (10.3)	7 (4.0)	63 (12.5)	0.002
Dialysis	25 (3.7)	8 (4.6)	17 (3.4)	0.454
Transfusion of blood products	21 (3.1)	3 (1.7)	18 (3.6)	0.228
Nutrition	9 (1.3)	3 (1.7)	6 (1.2)	0.701

* p value for medical withdrawing vs. premature withdrawing.

Figures

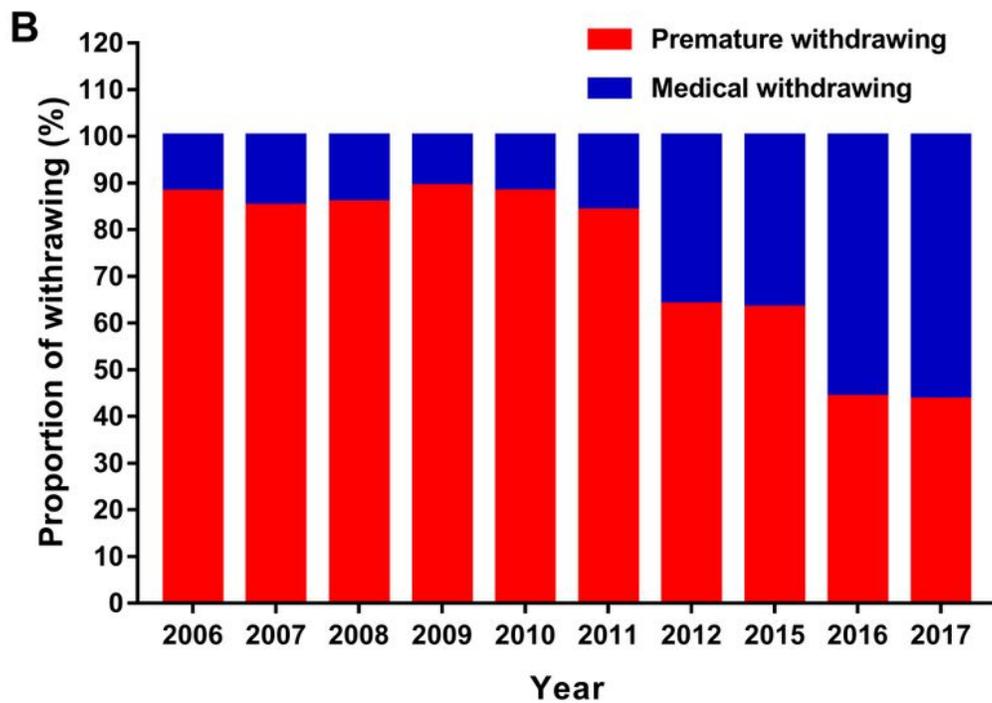
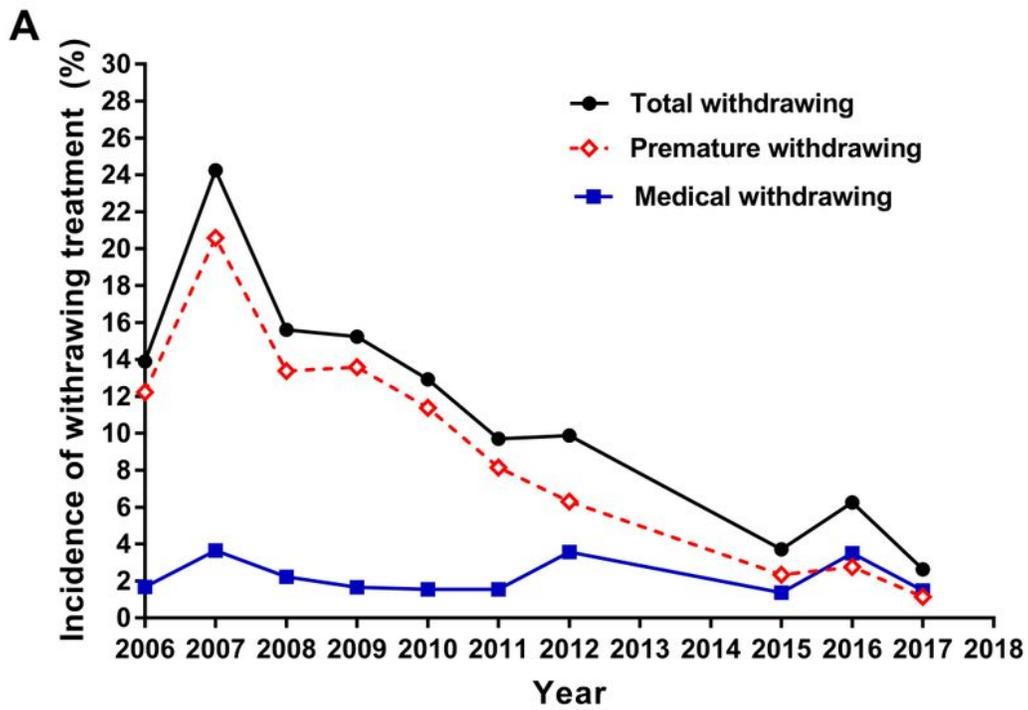


Figure 1

Incidence and proportion of withdrawing treatment in 680 children during 2006–2017.

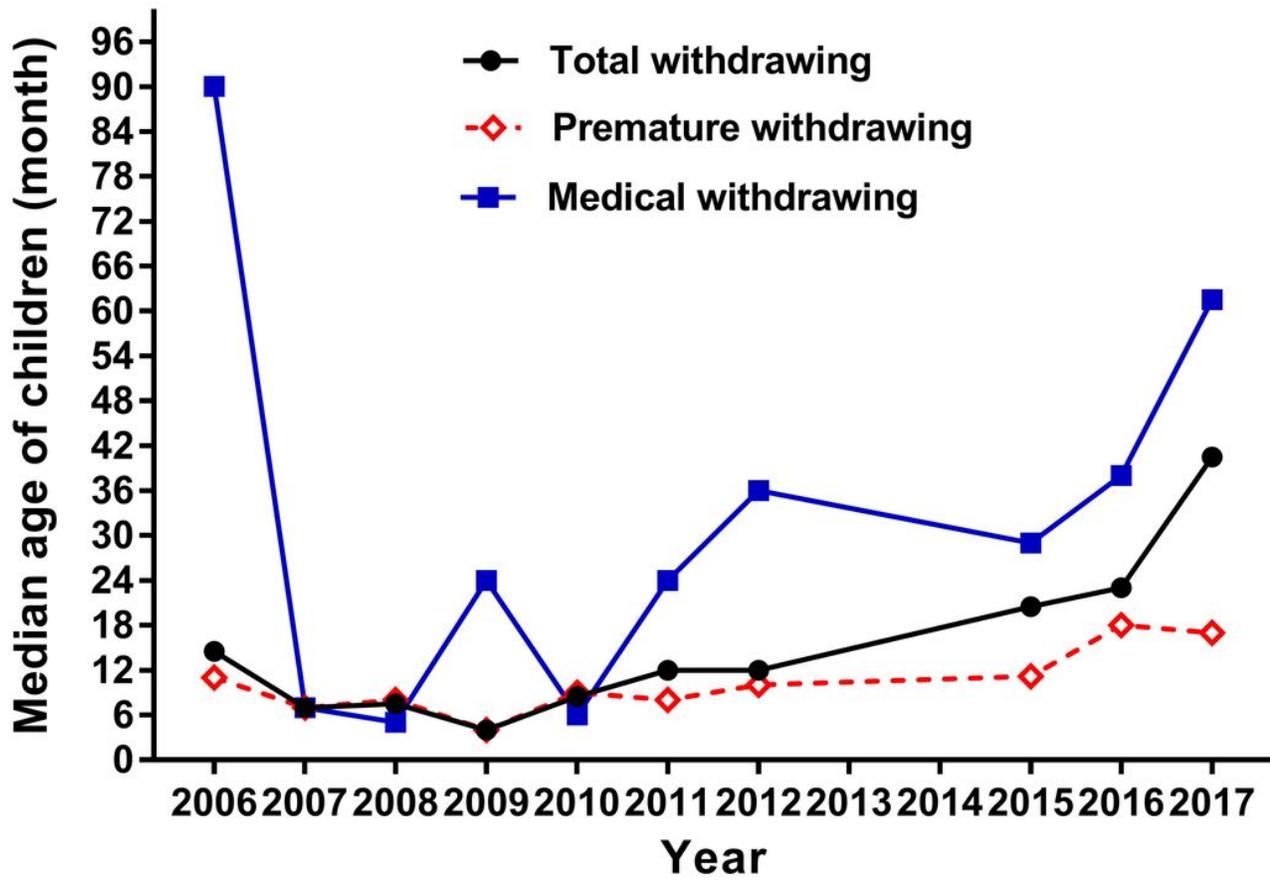


Figure 2

The median age of children whose treatment was withdrawn during 2006–2017.