Annual Report IC Kinderen 2012
Erasmus MC-Sophia Children's Hospital
Rotterdam, The Netherlands
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1 Introduction

In the year 2012, the staff of the Sophia Children’s Hospital, as a part of the Erasmus MC, invested a lot in corporation and the creation of a vision and mission for the Sophia. Streamlining and optimizing patient care throughout the Sophia’s Children’s Hospital including optimizing multidisciplinary corporation as well as facing the future challenges in patient safety issues as well as financial. The IC Kinderen of the Sophia is involved in many processes and leading in some parts. For example, the position of the Admission Coordinator, who coordinates the number of admissions internally and externally for the IC Kinderen, is introduced as a blue print in the Theme Sophia, to broaden this coordination. Together they are responsible for the whole process of logistic and weekly meetings to coordinate this process are scheduled. Another example is the bed capacity in Pallieterburgh in Capelle aan den IJssel; to make sure, this capacity is 80-90%. Together as a shared responsibility, we make sure this capacity is achievable. At the Pallieterburgh we started admitting children for MKR during the week and in the weekend admitting children for ‘respijtzorg’. These initiatives will guarantee admissions and therefore create space at the IC and MC. Another big advantage is that the children are having the MKR in a much more pleasant environment. The ‘respijtzorg’ can be provided in the weekend to reduce the burden of care for parents for a short period. The IC Kinderen also provided agreements with the surgeons to ensure IC beds after surgery. In our continuous quality improvement program involving patient care, education and research our aim remains to be within the top five of pediatric intensive care units in Europe.

The scientific output remained of high standard bringing 77% of all peer review manuscripts in the Q1 and the Q2 with a significant increase in mean numbers from 38 in the period 2008-2010 to 48 in 2012. Again major grant applications were rewarded both from ZonMW, NWO as well as the Sophia Foundation. In total 7 PhD-students finalized their thesis. We continue our scientific output at a high level mainly integrated in the top research schools of the Erasmus MC. The attraction of future fellows and staff is aiming to enhance the number of clinician-scientists combining state of the art care/cure and bringing the level of knowledge to a higher level.

Inge van ‘t Wout

Dick Tibboel
2 Patient population

2.1 PICE

Number of admissions: N = 1855
Girls: 823  (44.4%)
Boys: 1032  (52.5%)

Admission days between 1 and 301 days, median 2 days
Admission days 2012:  10014 days
Rejected admissions:  168

Age at admission between 0 and 26 years, median 1 year
Age groups
0-28 days:  253 (13.6%)
29 days-1 year:  560 (30.2%)
1-4 years:  386 (20.8%)
Older than 4 years:  656 (35.4%)

Deceased patients: 47

PICU/NICU transports 2012: 108
Reason for admission:

1. respiratory infections, tracheacanule, respiratory insufficiency, asthma, starting non invasive ventilation

2. sepsis, cor vitium, postop cardio surgery, cardiomyopathy, heart transplant, shock, resuscitation, arrhythmias, CRS

3. (acquired intestinal problems) NEC, malrotation, volvulus, gastroenteritis, ileus, abdominal trauma, mec plug, pyloric stenosis

4. neurological tumor, neurological trauma, coma, epilepsy, meningitis, haemorrhages, AVM, near drowning, febrile convulsion

5. hernia, abdominal defects, atresia, renal abnormalities, MMC, anomalies, CCAML

6. MKR/ major survey, ICP reading, invasive RR reading, post-scope, post MRI, post angiography, medication test, Schwann Ganz reading, ALTE

7. hernia, cranium, scoliosis, renal transplantation, placement line/drain, postop pain medication, ATE, minor interventions

8. diabetic ketoacidosis, hyperbilirubinaemie, hepatic failure, sickle cell crisis, immune disorder, renal failure/HUS
Ventilation days (invasive en non invasive)

<table>
<thead>
<tr>
<th></th>
<th>Number of patients</th>
<th>% patients</th>
<th>Minimum duration</th>
<th>Maximum duration</th>
<th>Median duration</th>
<th>Total number of days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventilation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>invasive N = 499</td>
<td>26.9%</td>
<td>1</td>
<td>262</td>
<td>3</td>
<td>3152</td>
<td></td>
</tr>
<tr>
<td>non invasive N = 209</td>
<td>11.3%</td>
<td>1</td>
<td>341</td>
<td>2</td>
<td>1627</td>
<td></td>
</tr>
</tbody>
</table>

2.2 ExtraCorporeal Membrane Oxygenation (ECMO)

Like in the previous years, the ICK expertise was intensively used. Apart from the common pediatric intensive care the ICK has a clear quaternary IC function for particular interventions or fields of expertise. One of these fields is ExtraCorporeal Membrane Oxygenation (ECMO), a technique that provides respiratory and/or circulatory support. Treatment can be distinguished into neonatal and non-neonatal ECMO and into respiratory and circulatory support.

Internationally as well as locally a decrease in neonatal ECMO and an increase in pediatric ECMO is observed. Neonates with high survival rates like meconium aspiration syndrome are less and less presented for ECMO, possibly indicating better perincatal care, where experience in pediatric ECMO results in successfully completing long-term difficult cases.

In 2012 close relations have been established with the manufacturer of the ECMO machines and because of our large experience in neonatal and pediatric ECMO we have been designated as reference centre. This contact keeps the ICK in the frontline of ECMO developments.

All ECMO data are registered in an international database run by ‘The Extracorporeal Life Support Organization’ (ELSO). This database provides for international benchmarking, as shown in table 1. This table contains the ICK data as well as the international survival rates for neonatal respiratory ECMO patients. These data show that our unit, in accordance with international data, has a declining rate of ECMO use over the last years.

In 2012 a total of 26 patients from all over the Netherlands suffering from respiratory or circulatory failure received ECMO treatment in the ICK. Tabel 1 & 2 show the results the respiratory ECMO patients. In the entire ECMO group thirteen patients were older than 28 days. Improved neonatal care and more lung-protective ventilation in pediatric patients could explain this trend.

### Neonatal Respiratory Runs per year in the Erasmus MC-Sophia Children’s Hospital

| Runs per year | Cumulative Runs | Mean duration | Longest duration No. Survived % Survived International % Survived |
|---------------|-----------------|---------------|-----------------|--------------------|----------------------|
| 2009          | 13              | 365           | 199             | 456                | 6                    | 46% 68%              |
| 2010          | 18              | 383           | 187             | 462                | 12                   | 67% 69%              |
| 2011          | 11              | 394           | 176             | 354                | 7                    | 64% 65%              |
| 2012          | 9               | 403           | 144             | 388                | 4                    | 44% 70%              |

*Table 1. Mean duration in hours. Survived = survival until discharge or transfer*
Table 2 shows the ICK data and international survival rates for ECMO-treated respiratory insufficient patients older than 1 month.

<table>
<thead>
<tr>
<th>Year</th>
<th>Runs per year</th>
<th>Cumulative Runs</th>
<th>Mean duration</th>
<th>Longest duration</th>
<th>No. Survived</th>
<th>% Survived</th>
<th>International % Survived</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>13</td>
<td>68</td>
<td>268</td>
<td>924</td>
<td>9</td>
<td>69%</td>
<td>56%</td>
</tr>
<tr>
<td>2010</td>
<td>7</td>
<td>75</td>
<td>231</td>
<td>636</td>
<td>3</td>
<td>43%</td>
<td>59%</td>
</tr>
<tr>
<td>2011</td>
<td>8</td>
<td>95</td>
<td>134</td>
<td>182</td>
<td>6</td>
<td>75%</td>
<td>58%</td>
</tr>
<tr>
<td>2012</td>
<td>9</td>
<td>104</td>
<td>258</td>
<td>574</td>
<td>7</td>
<td>78%</td>
<td>61%</td>
</tr>
</tbody>
</table>

Table 2. Mean duration in hours. Survived = survival until discharge or transfer

Apart from respiratory support, the ECMO expertise in 2012 was regularly applied to patients suffering from circulatory failure, either following on to or directly after open-heart surgery or in patients in need of mechanical cardiac support suffering from failing heart pump function. Internationally a small increase in the use of ECMO in the cardiac setting can be observed.

Over the last few years an increase is observed in pediatric patients with primary cardiac outof hospital cardiac arrest (OHCA). Selection of eligible patients for ECMO-CPR according the recent literature in an improved survival compared to conventional CPR. This procedure is a high stress multidisciplinary effort that gets more and more embedded in the process of caring for these CPR cases.

In 2013 our ECMO system will be available for inter hospital transport even in small regular ambulances. This opens the possibility to centralize ECMO care for pediatric patients in The Netherlands. This will put a strain on resources and a financial compensation for this services needs to be established.

2.3 Cardiology

After publication of the Ministry of Health, Welfare and Sport report on pediatric cardiac interventions in 2008 the minister declared that no more than three centers are needed and purposeful to provide appropriate care to children with congenital heart defects in the Netherlands. Erasmus MC-Sophia was one of the designated centers, next to Leiden and Groningen. On second thought, Utrecht was added to these three. Since then we have further tried to fulfill the needed requirements. Erasmus MC-Sophia is and has always been the national center for heart transplantations and assist devices in children. Neonatal and pediatric ECMO are available at our department. We can offer treatment for the full spectrum of heart defects in children in all age groups.

After changing the perioperative care (such as postoperative recovery) of children with congenital heart disease in 2009 in the ICK we have further realized most of the started work from 2009. In the meantime the new staff in the pediatric cardio-anesthesiology can guarantee 7x24 hour facilities to perform surgery. After initial postoperative recovery in the thorax center where the children are monitored from specially trained pediatric nurses in combination with the pediatric cardio-anesthesiologist. They get transported under supervision of the pediatric intensivist. A special transport unit, in order to reduce complication, has been customized and most of the children are transported on it in the meantime.
With the new staff for IC there are 1 pediatric intensivist and 1 pediatric intensivist-cardiologist in charge for these patients. We have formed one part from the department into a special cardiac unit where all children with heart disease and malformations are admitted and being nursed. In order to fulfill the national requirements another cardiothoracic surgeon was employed. He is now being trained in the subspecialty pediatric cardiothoracic surgery and is lately getting very involved with the pediatric program. Every morning there is a round with the intensivist, cardiothoracic surgeon and pediatric cardiologist. Furthermore, there is a weekly cardiothoracic conference where all the patients are discussed and the future therapies get defined.

The number of patients treated in 2012 was slightly higher than in 2011 concerning operations with CPB. In summary, 144 operations CPB and 88 without heart-lung machine were performed in children beneath 18 years of age. The overall 30 day mortality was below 5%. One child received cardiac ECMO treatment to counteract postoperative complications, which did not resolve and the patient died some days after operation. One child with severe cardiac failure has been supported by a leftventricular assist device (Berlin Heart, Levitronix). The patient could be successfully transplanted after stabilization on the assist device.

Donor supply was and is scarce in the past years, but in 2011 and 2012 we have transplanted 5 children each year which is a considerable increase. None of the patients on the waiting list died. The increase of transplantation within the last years is mainly due to the good results. Further more and more children with end stage heart failure have been admitted over the last years in order to treat or screen them for heart transplantation (CARS study, M. Dalinghaus, MD, PhD).

2.4 Centre for home-ventilation and respiratory disorders (CTB&A)

The centre for home-ventilation and respiratory disorders has 3 major fields of patient care; care of children on home ventilation, care of children with a tracheacanula and screening of children with respiratory disorders with polysomnography.

2.4.1 Home Ventilation

The Sophia Centre for Home Ventilations is one of the five centres for home mechanical ventilation in The Netherlands. The others are run in Utrecht, Groningen, Maastricht and Rotterdam (Erasmus MC, adult care). The Sophia centre is the only one dedicated to children.

A multidisciplinary program has been organized to manage the complex care of the children with home ventilation, their parents and professionals. The aim of this program is to reduce multiple hospital visits and to improve collaboration among various home care professionals.

Children with home ventilation and children in a preliminary phase for home ventilation are invited for an annually hospital admission. During this hospital visit the required investigations are planned and the various specialists visit the patient and parents. During the night a polysomnography takes place.

Patient numbers

At the end of 2012, 107 patients were seen for home ventilation; 72 patients were on home ventilation. The other 35 patients were in preparation for home ventilation. The total number of patients increased again in 2012. Especially, the number of young children (under the age of 6) is increasing. The home ventilation team consists of a 1 paediatrician, 5 nurses, 1 technician, a secretary and a 1 social worker.
2.4.2 Home care for children with a tracheacanula

Patients

Children with a tracheacanula are seen on a regular base in a multidisciplinary team with ENT surgeon, pediatrician, specialized nurse and social worker. In 2012 two new ENT surgeons started to participate in this multidisciplinary team. In 2012 a total of 35 children had a tracheacanula 5 of them were new patients and 4 children were decanulated. One patient died, this was not related to the tracheacanula. The table gives an overview of the number of children with a tracheacanula and decanulations from 2000 to 2012.

2.4.3 Polysomnography

Measurements for the polysomnography program in 2012 were done partly on the PICU in Sophia Children’s Hospital and partly in the high care facility Pallieterburght. In almost all children level 1 polysomnography was done due to a close collaboration with the department of neurophysiology. In 2012 in total 287 measurements were performed.
2.5 Pallieterburght

Over the past years the Pallieter Foundation built Pallieterburght, a home for chronically and terminally ill children. After years of fund raising, Prime Minister Balkenende eventually opened Pallieterburght as a 24-hour care facility in June 2009. This was just after the Ministry of Health, Welfare and Sports had approved the two-year financing of Pallieterburght as sub-unit of the ICK in the Erasmus MC-Sophia Children’s Hospital as an extramural hospital function. On January 5th, 2010 the facility was ready for 24-hour care according to Erasmus-MC Sophia standards and was opened with 4 beds. This was followed in September 2010 with an additional 2 beds. Electronic systems like PDMS and Elpado as used on the ICU are in full operation.

ICK6-Pallieterburght now consists of a 6-bed 24-hour unit with six individual patient rooms and rooming-in facilities for parents. One of the functions of the unit is serving as an interim location between the ICU and home for children who will be discharged with many medical appliances whose parents are in the process of learning the necessary nursing care so children can be discharged home. Admission consist of for example, children with tracheal cannula’s, chronic home ventilation and children with short-bowel syndrome receiving home TPN (Total Parenteral Nutrition). Palliative care is offered when needed. The main difference with the common hospital situation is that efforts are directed at emphasizing the child’s healthy sides, stimulating psychomotor and mental development and creating a home-like atmosphere.

Physiotherapy and psychological follow-up is provided by the ChIL follow-up team members. Moreover, speech therapists of the Erasmus MC-Sophia started consultations at the Pallieterburght. Ongoing training was given to both medical and nursing personnel to better handle the multi-problem families that are an important part of the patient population of Pallieterburght. Main aim was to reduce length of stay of this group of patients.

Daily nursing care is provided by a dedicated team of ICU and HC nurses, for the majority rotating between the ICU and Pallieterburght and by nurse assistants. Daily supervision of the Pallieterburght is provided by Saskia Gischler, MD PhD.

During 2012, 37 different children were admitted, some repeatedly, resulting in a 63% occupancy of bed capacity in the third year. Median length of stay (excluding polysomnography patients) was reduced from 46 days to 20 days due to increased efficiency. Twenty-four-hour polysomnography admissions were initiated in Pallieterburght starting December 2012. This increases bed occupancy and diminishes pressure on ICU beds. Of the 37 admissions 7 were for polysomnography.

2.6 Long term follow-up team (CHIL-team)

In 1999 a prospective longitudinal follow-up program was started for children with major anatomical congenital malformations. Initially, only patients from the Pediatric Surgical ICU were included. At present, children with malformations such as Hirschsprung’s disease and anorectal malformations who are initially admitted to the Medium Care ward are included as well. In 2001, a similar follow-up program for ECMO-treated patients was introduced.

In 2008, children with anatomical congenital malformations aged 12-18 years were invited to join the follow-up program: approximately 50% of children with colorectal malformations, Congenital Diaphragmatic Hernia (CDH) and Esophageal Atresia (EA) entered the program. For those with
congenital malformations who joined the program prospectively, the proportion of refusals to participate ranged from 9-15%. In 2010, we also included pediatric patients with hypoxic-ischemic trauma, e.g. near-drowning patients and admission following resuscitation. However, the majority died or joined another follow-up program (e.g. in the oncology or cardiology department). In 2001 a prospective longitudinal follow-up program was started for children with meningococcal septic shock admitted to the PICU. A cohort of 94 pediatric patients was evaluated by one of the pediatric intensivists (Corinne Buysse, MD, PhD). At present, 54 of them still join the follow-up program (see Table).

Activities in 2012

In June 2012, we started a follow-up program for children who were treated in the ICU for hypoxic ischemic events (e.g. cardiopulmonary resuscitation or near-drowning) and for severe neurotrauma (Corinne Buysse, Karin Geleijns).

At the end of 2012, a total number of 1272 survivors participated in the follow-up program (an increase of 193 patients). See Table.

<table>
<thead>
<tr>
<th>Category</th>
<th>N in follow-up end 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorectal malformations</td>
<td>326</td>
</tr>
<tr>
<td>Esophageal atresia</td>
<td>177</td>
</tr>
<tr>
<td>CDH and congenital lung malformation with resection</td>
<td>257</td>
</tr>
<tr>
<td>Congenital lung malformation without resection</td>
<td>62</td>
</tr>
<tr>
<td>Uncomplicated abdominal wall defects (AWD) and small intestinal atresias (SIA)</td>
<td>84</td>
</tr>
<tr>
<td>Complicated AWD and short bowel syndrome</td>
<td>18</td>
</tr>
<tr>
<td>Neonatal ECMO</td>
<td>197</td>
</tr>
<tr>
<td>Pediatric ECMO (age &gt;28 days)</td>
<td>78</td>
</tr>
<tr>
<td>Meningococcal septic shock</td>
<td>54</td>
</tr>
<tr>
<td>Hypoxic Ischemic event</td>
<td>7</td>
</tr>
<tr>
<td>Neurotrauma (severe)</td>
<td>7</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>5</td>
</tr>
</tbody>
</table>

Staff

Hanneke Ijsselstijn pediatrician, genetic pediatrics (coordination CHIL-team)
Corinne Buysse, Saskia Gischler pediatric intensivists
Karin Geleijns pediatric neurologist
Ulrike Kraemer pediatric cardiologist
Yolande van Bever clinical geneticist
Marjolein Spoel physician
Monique van der Cammen-van Zijp pediatric physical therapist
Annabel van Gils-Frijters
Anne Zirarpsychologists Daniel Hanauer Stuit social worker
all pediatric surgeons (except Sheila Terwisscha)
2.7 Evidence-based Pharmacotherapy – InMPhACT

InMPhACT is the Center of Excellence for Pediatric Intensive Care Clinical Pharmacology at the Erasmus MC Sophia Children’s Hospital.

Research
2012 was a successful year for our Clinical Pharmacology research with € 500.000 million new grant funding and over 30 peer-reviewed publications.

Our ongoing research program focuses on clinical trials and mechanistic studies. More specifically, our clinical studies have largely focused on analgesics and sedatives. In 2012, the paracetamol IV – morphine trial was accepted for publication in JAMA. Ongoing studies are the Daily Sedation Interruption trial (DSI) and a ventolin PK-PD study. For the DSI study, two additional centers were added to our multi-center study (LUMC, AMC) in the context of the PICU-Network of Excellence.

We initiated in vitro studies on the ontogeny of drug transporters in children, from biobank and surgical tissues in collaboration with the University of Western Ontario, Canada and Children’s Mercy Hospital, US and with our own Pediatrics Laboratory. Pediatric drug absorption simulation studies were initiated, using the Pediatric TNO intestinal model in collaboration with TNO Zeist. In the context of a TIPharma project and in collaboration with Leiden University, our group was involved in mechanistic PK-PD studies to develop in vivo maturation models for main drug excretion pathways.

Teaching
We offer an accredited teaching program for (pediatric) clinical pharmacologists. One PhD student/resident was accepted in the program. A case-based clinical teaching module for PICU residents was implemented in 2012.

Our group actively participated in national and local teaching programs for fellows and residents (pediatrics, anesthesiology, hospital pharmacists), undergraduate medical students and in continuous medical education programs (pediatricians, obstetricians and pharmacists). Our research teaching program in clinical pharmacology consists of weekly research rounds, where students and staff present their research and/or pharmacokinetics teaching. In addition, more than 5 trainees successfully followed the NIH Clinical Pharmacology program, which is offered as a distant learning program.

Clinical care
In 2011, monthly clinical ICU case presentations were launched in collaboration with our pediatric hospital pharmacists. In these rounds, interesting clinical pharmacology cases from our unit were presented and discussed. Clinical pharmacology consults were provided both in the ICU and outside to support staff with clinical pharmacology-related questions. A main focus of these consults is sedation withdrawal dosing advices.

Management
Dr de Wildt is member of the Erasmus MC research ethics board, as well as Treasurer for the European Society of Developmental Pediatric and Perinatal Pharmacology and Board Member at large for the American Society of Clinical Pharmacology and Therapeutics.
3 Quality

3.1 Patient Safety Management System Activities

This document presents the Activities Report 2012 on the basis of the patient safety business plan and follows the basic requirements laid down in the Dutch Technical Agreement (*Nederlands Technische Afspraak*; NTA). First we report the current state as regards the central themes for 2012:

**Prevention of central venous catheter-related sepsis**

The developed care bundle protocols for catheter insertion and maintenance on the guidance of the *Zorggids Veilige Zorg voor Zieke Kinderen* is introduced on the ICU. The registration of numbers of days patients have lines inserted as well as the occurrences of catheter-related sepsis are counted since then. Ongoing attention is required to enhance adherence to the new protocol. Especially new rules like applying a drying time of 30 seconds before start of the intervention appears to be hard to follow.

**Prevention of accidental extubation**

The number of ventilator days and accidental extubations per 100 ventilator days are recorded. To reduce the accidental extubations, a new method to fixate the tube was introduced. Together with more control moments and control items in PDMS we expect that the accidental extubations will decrease. Results of this intervention will be forthcoming next year.

**Prevention of medication errors:**

For the importance of the double check of medication administration was emphasized regularly this year. In the Patient Safety week awareness created for this topic by using screensavers, interviews and by demonstrating how the double check should be performed.

Barcoding of iv medication and the appliance of smart pump technology is still not possible.

**Other topics:**

- The digital incident reporting system was introduced. There was a slow start up due to many system’s problems, which have almost all been solved.
- The Safety Action Team had more time to conduct analyses like PRISMA, 21 PRISMA’s were completed, the most frequent root causes were: organization and management issues, safety culture, protocol errors and verification errors.

The following improvement strategies have been implemented:

- Organization and management
  - the use of briefings and debriefings
  - coordination of admissions and discharges
  - Daily Goal Sheets
- Culture
  - CRM base- and follow-up courses
  - implementation of RMS
- Protocols
  - Critical Nursing Situation Index is “standard of care”
• protocol development of Nitric Oxide administration via a new device
• Verification
  • awareness of “the double check”, especially in critical situations

NTA basic requirements
1. Board of Directors
One Safety Walk Round was held in 2012 joined by one of the members of the Board of Directors. During Safety Rounds we ask representatives of various disciplines as well as patients and/or parents about their experiences with matters of patient safety and staff safety.

2. Leadership
Patient Safety is integrated in the ICU Children. Research and Education in this area is the next step that needs to be developed more

3. Communication
Once every 6 weeks a particular safety issue is extensively discussed in the Groot Regie Overleg meeting. All initiatives regarding patient safety at the IC Kinderen are communicated to all team members via the ICK newsletter, but also via the Safety First journal, news flashes, and screensavers. Sophia-wide Patient Safety meetings were held every 6-8 weeks. Various Sophia-wide patient safety issues have been discussed, as well as incident reports, analyses of these incidents, and possible improvement actions.

4. Staff
More PRISMA-analyses (21) have been performed with regard to accidental extubations, medication errors and incident reports involving moderate or serious actual harm to the patient. One of the nursing researchers has evaluated the feasibility of the CNSI, and has started implementing this as “standard of care” in the ICU. The Sophia Simulation Team Training trainers have trained all nurses and physicians at unitlevel. Satisfaction and safety was rated as high. There was also a CRM follow-up team scenario done for the ICU for Children.

5. Management by third parties
Safety aspects for externals are not worked out on unit level. There is a protocol search what the rules are for trainees and “guests”

6. Patient participation
One Safety Walk Rounds was held at the IC Kinderen in 2012. The parent satisfaction evaluation was provided to the team through the News Letter with examples of how parents experienced their child’s stay.

7. Prospective risk assessment
No HFMEA analyses were done this year.

8. Operational control measures
The Safety Action Teams are closely involved in the RMS and will help implement this early 2012. Until the system is operational they will be responsible for entering and coding the Safety First reports. Several PRISMA-analyses have been performed and improvement actions have been
communicated/implemented to/by various working groups. Registration of complications by the physicians remains a moot point and a more effective registration system is being considered. CNSI observations have been well established and will be used as ‘standard of care’.

The use of the Pediatric Triggertool was started this year and provided indispensible information about the actual adverse events on the ICU.

<table>
<thead>
<tr>
<th>length of stay</th>
<th>No patients</th>
<th>% patiënts</th>
<th>No AE</th>
<th>% AE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2 days</td>
<td>1115</td>
<td>60.1%</td>
<td>94</td>
<td>10%</td>
</tr>
<tr>
<td>3-7 days</td>
<td>472</td>
<td>25.4%</td>
<td>238</td>
<td>25.2%</td>
</tr>
<tr>
<td>8-30 days</td>
<td>226</td>
<td>12.2%</td>
<td>422</td>
<td>44.7%</td>
</tr>
<tr>
<td>&gt; 30 days</td>
<td>42</td>
<td>2.3%</td>
<td>190</td>
<td>20.1%</td>
</tr>
<tr>
<td>Total</td>
<td>1855</td>
<td>100%</td>
<td>944</td>
<td>100%</td>
</tr>
</tbody>
</table>

The Daily Goal Sheets are part of the catheter-related sepsis reduction implementation plan.

The CRM basic training course was offered once this year to new staff.

9. Incident reporting and retrospective risk assessment

All staff is instructed individually on RMS reporting. There were one SIRE analyses, one Tripod analyses and 21 PRISMA analyses done in the PICU.
10. Monitoring of outcomes and reporting
A tailor-made database is in place that meets all PVMS requirements. Furthermore, the data manager is involved in research meetings to discuss trends in incidents, patient outcomes, adverse events, etcetera, and to study the effects of interventions.

11. Improving safety of care
Good instruction has resulted in safer use of the NO device. Safety First reports always necessitate ad hoc improvement actions. The safety of the new enteral feeding system will be re evaluated after some time. The use of the PICU Triggertool will make clear what interventions will be most effective.

12. Other activities
The Quality and Safety in Healthcare congress in Paris was attended by 2 Patient Safety officers and the nursing staff from the IC Kinderen. There was a workshop given on CRM on the (IMSH) International Meeting Society for Simulation in Healthcare in San Diego. On Bonaire there was education given about patient safety and CRM. There was a lecture given on the Risky Business Conference in London, Pediatrics Day. The Pediatric Psychiatric department was educated in Patient Safety. During the Patient Safety Week, There was a Prisma Experience Day where the PSO’s participated. The CRM workshop is also given on the conference “Samen Sterk”
4 Education and training

4.1 A(N)IOS (residents)

Pediatricians/intensive care physicians Linda Corel and Corinne Buysse are accountable for the scheduling and supervision of residents in the ICK. All A(N)IOS are assigned a mentor during their traineeship. The ICK accommodates AIOS from the departments of Anesthesiology and Pediatrics and ANIOS from the departments of Pediatric Surgery and Pediatrics. All A(N)IOS follow the same educational program.

All A(N)IOS are offered an introductory program designed to get acquainted with the unit in general and with the most used equipment. In addition all new A(N)IOS are instructed in mechanical ventilation modes as well as sedation and pain management.

All A(N)IOS follow the obligatory pediatric training program. In addition, on the ICK the educational structure is as follows:

1. pediatric cardiology theoretical instruction every two weeks on Tuesday;
2. Tuesday-morning meetings every two weeks, alternatingly protocols, presentations by A(N)IOS, discussing questions from the MCCKAP board exam for fellows in pediatric ICU; weekly lectures or instruction on pediatric ICU topics on Wednesday, alternatingly theoretical and bedside teaching;
3. Literature review on Thursday
4. all AIOS give a presentation during their traineeship;
5. mortality and morbidity round on Thursday;
6. weekly clinic’s evaluation on Friday afternoon, aimed at discussing technical, organizational and emotional aspects of the profession among A(N)IOS, fellows and staff;
7. weekly teaching round on Thursday afternoon, aimed at synchronizing policy and teaching for fellows and A(N)IOS. Selected patients admitted to the ICU are discussed.
8. A(N)IOS participate in the APLS training as well as the interactive scenario training program for nurses and medical staff;
9. A(N)IOS perform a structured APLS scenario exam at the end of their PICU period.

4.2 Fellows

Matthijs de Hoog is the program director for fellows intensive care, Dick Tibboel is deputy director. The training program was assessed in 2009 and the full program was accredited for 5 years. A training plan has been prepared reflecting the structure and content of the training program in the ICK.

The training program for pediatric intensive care physicians includes the following activities:

1. participation in ward rounds, lectures, bedside teaching, mortality and morbidity rounds and scenario training as mentioned above;
2. participation in national PICU educational days;
3. participation in the MCCKAPP (Multidisciplinary Critical Care Knowledge Assessment Program) examination of the SCCM (since 2009);
4. thematic evening meetings with selected PICU staff or other specialists. Topics are interactively discussed with fellows;
5. participation at least once in:
a. European Postgraduate Course in Neonatal and Paediatric Intensive Care in Bern;

b. Pediatric Multiprofessional Critical Care Review of the SCCM (USA);

6. participation in research activities, with a labelled period of 6 months for research.

In 2012, Jan Willem Kuiper and Valerie Sloof started their PICU fellowship. Erik Bokhorst and Caroline vd Maarel participated as fellows from the Pediatric Anesthesia department. Nicoline Ran and Marijke vd Meulen partook in the fellowship program for one year.

4.3 Nursing

We expect nurses in our IC Kinderen (ICK) to display an academic, proactive and inquisitive attitude. This unconditionally requires that we should facilitate high-level knowledge development and knowledge transfer. An additional requirement is establishing a positive, continually-learning and safe learning climate.

The competence-based learning approach will be retained in an intensive collaboration between the Erasmus MC Zorgacademie and the clinical trainers. This will ensure that the theoretical assignments are geared to practice conditions. An educational plan will be prepared detailing the basic requirements we expect each HC- and each IC-nurse to meet. This will form the basis for a description of what is expected from the different expertise groups. Requirements will be formulated in close consultation with all staff.

Every year the nursing education staff officer Carla Kops, together with education officer Gabrielle de Vogel and scheduler Erik van Lenten, organizes many training sessions for permanent staff. This is done in close collaboration with quality consultant Ada van den Bos who is functioning as contact for the scenario trainers. An example of structural education is the unit training in groups of about ten nurses. Sessions consist of several hours’ knowledge transfer followed by scenario training, which provides the opportunity to integrate the knowledge in practice. This year we introduced knowledge tests. Lessons are geared to gaps in knowledge. Testing is repeated the following year to assess efficacy of the education. We also started brainstorming about the prof check. This will be further elaborated in 2013, so that we can start testing elements such as the APLS and BLS in 2014.

Furthermore, e-learning programs are being developed by the nursing education team which is composed of 7 senior education officers and 1 RVO. This team was established in 2012 and is responsible, among other things, for a good learning culture and quality assurance. They have all been instructed intensively about the art of coaching. Thus they are not only capable of coaching the students, but also the permanent staff. Two senior education officers will take a practice supervisor training course. The ICK department offers career perspectives in all fields. Apart from the education team four Ventilation Practitioners are active.

Apart from the nurses’ own educational development, they will be expected to be able to transfer their expertise to students, both in- and externally. In this way we contribute a great deal to our social responsibility of transferring knowledge to society and to other healthcare institutions (regionally and nationally). Methods to reach this goal include organizing symposia and participating in national and international congresses. Improving our quality level will enhance our attractiveness to new students and staff.
The clinical trainer (RVO) is entrusted with the coordination and organization of this comprehensive training and education program, supported by the nursing education staff officer. The program’s execution is provided by the ICK in collaboration with the Erasmus MC Zorgacademie. The program modules will be facilitated by nurses and physicians from the ICK. In this way the ICK training and education program is retained in our own center.

The ICK nursing education follows national developments. Cutbacks have necessitated us to streamline our system. It will be clear that education is essential to an IC department. Medical and technical developments are advancing very fast. Also social trends are reason to intensify knowledge transfer to parents and the patients themselves. More and more parents learn how they can manage their child’s condition at home and we also see an increase in the number of parents who participate in the care of their child. One element of our vision is perceiving the parents and their child as a close-knit unit. Our education is in line with this view. Learning is a joint enterprise.
5 Research

5.1 Peer reviewed manuscripts (international)

   IF 1.583  5-year IF 1.583 medicine, general & internal 59/151 Q2

   IF 2.764  5-year IF 2.587 hematology 31/67 Q2 oncology 90/196 Q2

   IF 6.109  5-year IF 5.486 pharmacology & pharmacy 13/260 Q1

   IF 2.030  5-year IF 1.978 critical care medicine 16/27 Q3 respiratory system 34/50 Q3

   IF 3.505  5-year IF 3.579 pediatrics 7/121 Q1

   IF 0.815  5-year IF 0.879 surgery 142/198 Q3 transplantation 23/26 Q4

   IF 2.944  5-year IF 3.216 biochemistry & molecular biology 131/290 Q2 pharmacology & pharmacy 78/260 Q2

   IF 4.405  5-year IF 4.508 biochemistry & molecular biology 68/290 Q1 pharmacology & pharmacy 36/260 Q1


   IF 0.839  5-year IF 0.830  surgery 141/198 Q3
   pediatrics 94/121 Q4

   IF 1.279  5-Year IF 1.288  Anesthesiology 19/28 Q3

   IF 1.831  5-Year IF 2.179  Medicine, General & Internal 52/153 Q2

   IF 1.039  5-Year IF none  Nursing 38/89 Q2

   IF 2.742  5-Year IF 2.738  Toxicology 33/83 Q2

31. The COMFORT behavior scale: is a shorter observation period feasible? (online brief report)
   IF 3.129  5-Year IF 2.973  Pediatrics 9/115 Q1

32. Biomarkers and clinical tools in critically ill children: are we heading toward tailored drug therapy?
   If 2.630  5-Year IF 1.952  Medicine, Research & Experimental 43/111 Q2

   If 3.939  5-Year IF 4.267  Anesthesiology 5/25 Q1

   IF 0.808  5-Year IF 0.824  Surgery 99/152 Q4

35. Update on pain assessment in sick neonates and infants. Dijk M van, Tibboel D. Pediatric Clinics of North America 2012; 59: 1167-1181
   IF 2.245  5-Year IF 2.171  Pediatrics 28/115 Q1


   IF 6.109  5-year IF 5.486  pharmacology & pharmacy 13/260 Q1

   IF 5.113  5-Year IF 4.879  Pharmacology & Pharmacy 18/261 Q1

   IF 5.437  5-Year IF 5.785  Pediatrics 2/115 Q1

   IF 6.318  5-Year IF 6.143  Pathology 3/78 Q1

   IF 1.674  5-Year IF 1.604  Pediatrics 46/115 Q2

   IF 1.962  5-Year IF 1.978  Dermatology 22/58 Q2

   IF 3.013  5-Year IF 3.342  Nutrition & Dietetics 19/72 Q2

   IF 1.450  5-Year IF 1.558  Surgery 92/182 Q2

   IF 5.437  5-Year IF 5.785  Pediatrics 2/115 Q1

   IF 2.300  5-Year IF 2.838  Health Care Sciences & Services 23/76 Q2
IF 7.667 5-Year IF 7.667 Cell Biology 28/181 Q1

IF 2.606 5-Year IF 2.617 Radiology, Nuclear Medicine & Medical Imaging 37/116 Q2

IF 2.425 5-Year IF 2.474 Pathology 30/79 Q2

IF 0.808 5-Year IF 0.824 Surgery 99/152 Q4

IF 2.391 5-Year IF 2.549 Genetics & Heredity 91/158 Q3

IF 5.895 5-Year IF 5.879 Respiratory System 3/48 Q1

IF 1.450 5-Year IF 1.558 Surgery 92/199 Q2

IF 3.129 5-Year IF 2.973 Pediatrics 9/115 Q1

IF 1.879 5-Year IF 1.731 Pediatrics 39/115 Q2
   IF 1.450 5-Year IF 1.558 Surgery 92/199 Q2

   IF 1.253 5-Year IF 1.152 Surgery 109/199 Q2

   IF 4.003 5-Year IF 3.689 Surgery 11/199 Q1

   IF 0.782 5-Year IF 1.002 Emergency Medicine 16/23 Q3

   IF 2.100 5-Year IF 1.771 Pediatrics 34/115 Q2

   IF 2.700 5-Year IF 2.728 Pediatrics 19/115 Q1

   IF 4.243 5-Year IF 3.848 Anesthesiology 3/28 Q1

   IF 4.400 5-Year IF 3.997 Genetics & Heredity 30/158 Q1

   IF 2.533 5-Year IF 2.058 Pediatrics 21/115 Q1

   IF 3.129 5-Year IF 2.973 Pediatrics 9/115 Q1
IF 3.129 5-Year IF 2.973 Pediatrics 9/115 Q1

IF 0.808 5-Year IF 0.824 Surgery 99/152 Q4

IF 4.093 5-Year IF 4.668 Pharmacology & Pharmacy 42/261 Q1

IF 7.636 5-Year IF 7.510 Genetics & Heredity 13/157 Q1

If 11.675 5-Year IF 12.455 Gastroenterology & Hepatology 1/74 Q1

If 5.113 5-Year IF 4.879 Pharmacology & Pharmacy 18/261 Q1

If 2.2.45 5-Year IF 2.171 Pediatrics 28/115 Q1

IF 0.808 5-Year IF 0.824 Surgery 99/152 Q4

   IF 2.311  5-Year IF 2.348  Pharmacology & Pharmacy 121/261 Q2

   IF 5.119  5-Year IF 5.930  Pediatrics 2/121 Q1


86. Critical illness is a major determinant of midazolam clearance in children aged 1 month to 17 years. Ince I, Wildt SN de, Peeters MY, Murry DJ, Tibboel D, Danhof M, Knibbe CA. Therapeutic Drug Monitoring 2012;34:381-389
   IF 2.491  5-Year IF 2.605  Pharmacology & Pharmacy 110/261 Q2

   IF 2.845  5-Year IF 2.663  Pharmacology & Pharmacy 91/261 Q2


5.2 Other Publications
   [Syncope in childhood: not always vasovagal in origin].

5.3 PhD Theses
   Congenital diaphragmatic hernia: a vascular disease.
   Thesis: Ilona Sluiter
   Promotors: prof. dr. D. Tibboel, prof. dr. I.K.M. Reiss
   Co-promotor: dr. R.J. Rottier
   February 23, 2012

   The pathogenesis of pulmonary hypoplasia in congenital diaphragmatic hernia.
   A continuing quest.
   Thesis: Rhiannon B. van Loenhout
   Promotor: prof. dr. D. Tibboel, prof. dr. M. Post
   Co-promotor: dr. R. Keijzer
   May 30, 2012
Intestinal crises in the newborn.
Thesis: Marie-Chantal Struijs
Promotors: prof. dr. D. Tibboel, prof. dr. J.B. van Goudoever
Co-promotor: dr. R. Keijzer
June 1, 2012

Genetiv and Epigentic Interplay in Congenital Diaphragmatic Hernia
Thesis: Danielle Veenma
Promotor: prof. dr. D. Tibboel
Co-promotor: dr. J.E.M.M. de Klein
June 6, 2012

Thesis: Sabine J.G.M. Ahlers
Co-promotor: dr. E.P.A. van Dongen
June 8, 2012

The air that we breath. Respiratory morbidity in children with congenital pulmonary Malformations.
Thesis: Marjolein Spoel
Promotors: prof. dr. D. Tibboel, prof. dr. J.C. de Jongste
Co-promotor: dr. H. Meijers-IJsselstijn
June 15, 2012

The paediatric skin at risk.
Thesis: Martin G.A. Baartmans
Promotor: prof. dr. D. Tibboel
Co-promotor: dr. M.K. Nieuwenhuis
June 20, 2012

Dyirng for Oxygen. Roles of Hypoxia Indiced Factor 2-alpha and 3-alpha during lung development.
Thesis: Yadi Huang
Promotors: prof. dr. D. Tibboel,
Co-promotor: dr. R.J. Rottier
June 29, 2012

Protein Anabolism in Critically Ill Children
Thesis: Carlijn de Betue
Promotors: prof. dr. D. Tibboel, prof. dr. N.E.P. Deutz
September 6, 2012

Size Does Matter; Drug Glucuronidation in Children.
Thesis: Elke H.J. Krekels
October 10, 2012
Balancing on Sox. Involvement of Sox2 in determination and maintenance of organ identity of the gastrointestinal tract.
Thesis: Lalini Jasoda Raghoebir
Promotor: prof. dr. D. Tibboel
Co-promotor: dr. R.J. Rottier
October 17, 2012

Without Uttering a Word
Thesis: Bram Valkenburg (cum laude)
Promotor: prof. dr. D. Tibboel
Co-promotor: dr. M. van Dijk
November 30, 2012

5.4 Benchmark

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<td>99</td>
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FIVE MANUSCRIPTS WITH THE HIGHEST IMPACT FACTOR

IF 11.675  5-Year IF 12.455  Gastroenterology & Hepatology 1/74 Q1

IF 7.667  5-Year IF 7.667  Cell Biology 28/181 Q1

IF 7.636  5-Year IF 7.510  Genetics & Heredity 13/157 Q1