



Chemotherapy intravenously in children with cancer at home, the nurse practitioner makes it possible!

N. T. M. Kok¹ · A. C. Ligthart-Beukhof² · M. D. van de Wetering²

Received: 11 March 2019 / Accepted: 22 August 2019 / Published online: 5 September 2019
© Springer-Verlag GmbH Germany, part of Springer Nature 2019

Abstract

Background Currently the entire treatment of a child with cancer is carried out in a specialized hospital. It would be ideal to conduct part of the treatment at home. This can only be done with adequately trained personnel. In the Netherlands, specialized pediatric oncology home care nurse practitioners have been trained to deliver this kind of care. Therefore, a pilot study was conducted to administer intravenous chemotherapy at home.

Purpose This study aimed to safely administer chemotherapy intravenously (iv) at home by specialized nurse practitioners and aimed to increase the quality of life (QOL) of the child and decrease the social burden in families with a child with acute lymphoblastic leukemia (ALL).

Method The pilot study was performed by well-trained home care nurse practitioners. Low-dose methotrexate iv and low-dose cytarabine iv were administered to 11 included children with ALL in their home environment.

Results QOL increased whereas social burden decreased for patients and parents. Chemotherapy administration in the home environment was safe with the help of well-trained nurse practitioners.

Conclusion It is feasible to administer intravenous chemotherapy at home in a safe and efficient way. The role of the specialized pediatric oncology nurse practitioner is an essential one.

Keywords Children · Cancer · Homecare · Chemotherapy · Nurse practitioner

Introduction

In the Netherlands, yearly 550 children are diagnosed with cancer. Treatment and survival rates improved, overall 5-year survival-rate is currently around 80% (<https://www.SKION.nl>). All children thrive by as little disruptions in their lives as possible [1]. Chemotherapy has to be administered in a specialized hospital and can last up to 3 years. Children visit the hospital regularly. To attend to the appointments, parents cannot go to work and children miss

school. It is difficult to continue a normal lifestyle, which influences the quality of life (QOL) [2].

Adequate trained Personnel

In the Netherlands, pediatric home care is provided by pediatric nurses. They are not qualified to perform physical examinations and before administering chemotherapy. This is the field of nurse practitioners.

Goal

The goal of this study was to explore if intravenous low-dose chemotherapy iv could be administered safely to pediatric oncology patients at home by specialized nurse practitioners.

The hypothesis was that QOL would increase and social burden would decrease. Administration of chemotherapy at home by a nurse practitioner would be safe and satisfactory.

✉ N. T. M. Kok
ntm kok@gmail.com

¹ University Medical Center Groningen, Groningen, Netherlands

² Prinses Maxima Center, Utrecht, Netherlands

Method

Design

A collaboration was formed between the Emma Children's Hospital of the University Medical Center Amsterdam, where the oncologists included the children, Mediq (medical equipment) who delivered chemotherapy and supplies, and KinderThuisZorg specialized pediatric homecare where the nurse practitioners worked. During 3 months, low-dose methotrexate iv (30 mg/m²) and low-dose cytarabine iv (75 mg/m²) were administered at home, by accessing the port a cath that all children in the Netherlands with cancer get at the start of their treatment.

Safety

Mediq is specialized in transporting hazardous substances such as chemotherapy. KinderThuisZorg provided adequate trained personnel (nurse practitioners) who assessed children in their home and decided if chemotherapy could not be given due to present side effects of the treatment such as fever or mucositis, or low blood counts. Verification of the medication by a second nurse practitioner by face time occurred before every administration. Children with medical problems before administration of the chemotherapy would be discussed over the phone with the responsible oncologist to come to the hospital, or the chemotherapy would be postponed. Parents were stimulated to call the oncologist if problems would occur or if the clinical situation of their child would change. The nurse practitioner would report the findings concerning the administration at home directly in the digital patient file.

Questionnaires

To monitor quality of life, social burden, and efficiency of the administration by the nurse practitioner, an explorative comparison study was conducted (Fig. 1).

A baseline survey (T0) was performed. A validated short QOL questionnaire was used to investigate quality of life during cancer treatment [3–5]. This was repeated 6 weeks into the

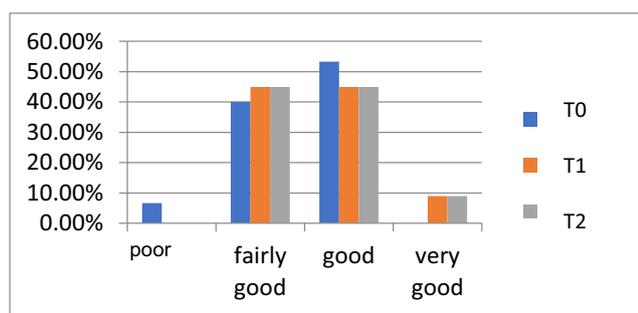


Fig. 1 Quality of life during T0, T1, and T2

pilot (T1) and after the pilot (T2). To measure social burden, a questionnaire was developed. A focus group (30 parents and 6 children > 12 years, who were not included in the pilot study) was formed for feedback on the posed questions. The nurse practitioner had direct contact with the parents during the entire pilot study, in which the questionnaires were offered and questions about the treatment could be answered.

Results

Children experienced an overall better quality of life during the study, compared with the chemotherapy administration in the hospital (Fig. 1). Most children stated that their QOL was good, some (6.7%) experienced their QOL as poor. In T1 some children (9%) validated their QOL as very good. None scored poor. Parents reported less social burden. Some parents had concerns about the safety of the administration of chemotherapy at home. After the first visit, they had no safety concerns anymore. All children received their chemotherapy as planned and no safety hazards occurred. They all expressed their wish for the pilot to continue.

Demographics

Three girls (36.4%) and 8 boys (63.6%) were included. The average age was 6 years (median 5, range 3–12). Six children received methotrexate (54.5%) and 5 children cytarabine (45.5%). All children were included in the ALL-11 protocol (national Dutch leukemia protocol).

Discussion

In this study, data was collected from a small group. Therefore, it is a pure descriptive study.

Several studies concerning the QOL in children with cancer, such as Fortier in 2013 [1], Calaminus in 2013 [6], and Endicot in 1993 [3], indicate that children with cancer experience a decreased QOL during treatment compared with the control group (e.g., children with other diseases). Administering chemotherapy at home could well reduce stress. In earlier studies, benefits of administering chemotherapy at home in children with cancer are suggested. Stevens et al. (2006) found in his randomized cross-over trial in 24 children evidence of less stress in parents of children receiving chemotherapy at home [7]. Kelly et al. (2014) found in an RCT in 161 parents that children were more at ease when receiving chemotherapy at home. Increasing QOL in children undergoing cancer treatment should be done in an as safe as possible way. Philips et al. (2011) looked at safety concerning administering chemotherapy at home. His prospective study in 50 children showed an increased QOL as well as more compliance in taking other medication [8].

Taylor et al. (2004) investigated in a systemic review the safety in administering chemotherapy at home. It showed that in 69 children, 17 administration errors were made and 7 administering errors computerized prescriptions and working with protocols should make chemotherapy at home safer [9]. In our study, verification of the medication by a second nurse practitioner through face time occurred in every administration. A note was reported in the child's hospital dossier after the administration of the chemotherapy. Kelly's research [10] showed that there was a lack of knowledge and skills in homecare nurses in administering chemotherapy at home in children with cancer safely.

No research has been done so far using the knowledge of nurse practitioners in pediatric homecare. Dudenstadt found that nurse practitioners in adult home care have an additional role [11]. Chicoine showed that nurse practitioners in homecare provide quality patient care [12]. Patients were more able to manage their own disease and focused increasingly on their health and self-regulation. One recommendation was to include more nurse practitioners in executing home care. In this study, chemotherapy was administered by nurse practitioners.

Conclusion

Administering chemotherapy at home by nurse practitioners is safe, efficient, and satisfactory. Nurse practitioners are skilled professionals who can make a difference in this specialized pediatric home care. This care can only be conducted in close collaboration with pediatric oncologists. It is recommended to ask health insurance companies to finance this innovative care to improve QOL of children with cancer during the trajectory of their treatment.

Acknowledgments The authors would like to thank Mediq Tefa, Emma kinderziekenhuis of the University Medical Center Amsterdam, and Kinderthuiszorg for making this pilot possible, and Prof. Dr. Mr. A.E.E.Verhagen of the University Medical Center Groningen for critically reviewing this manuscript.

Compliance with ethical standards

All procedures performed in studies involving the participants (e.g., children and their parents) were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical

standards. Informed consent was obtained from all individual participants included in the study.

Conflict of interest The authors declare that they have no conflict of interest.

References

1. Fortier MA, Batista ML, Wahi A, Kain A, Strom S, Sender LS (2013) Illness uncertainty and quality of life in children with cancer. *J Pediatr Hematol Oncol* 35(5):366–370
2. Queiroz D, Amorim M, Zandonade E, Miotto M (2015) Quality of life of children and adolescents with cancer: revision of studies literature that used the pediatric quality of life inventory. *Investig Educ Enferm* 33(2):343–354
3. Endicott J, Nee J, Harrison W, Blumenthal R (1993) Quality of Life Enjoyment and Satisfaction Questionnaire: a new measure. *Psychopharmacol Bull* 29:321–326
4. Burckhardt C, Anderson K (2003) The quality of life scale (QOLS): reliability, validity and utilization- BioMedCentral, 31-10-2003
5. Vidhubala E, Latha, Kannan R, Mani C, Karthikesh K, Muthuvel R, Surendran V, Premkumari R (2005) Validation of quality of life questionnaire for patients with cancer - Indian scenario. *Indian J Cancer* 42(3):138–144
6. Calaminus G, Weinspach S, Teske C, Göbel U (2000) Quality of life in children and adolescents with cancer. First results of an evaluation of 49 patients with the PEDQOL questionnaire. *Klin Padiatr* 212(4):211–215
7. Stevens B, Croxford R, McKeever P, Yamada J, Booth M, Daub S, Gafni A, Gammon J, Greenberg M (2006) Hospital and home chemotherapy for children with leukemia: a randomized cross-over study. *Pediatr Blood Cancer* 47:285–292 Oral Outpatient Chemotherapy
8. Phillips B, Richards M, Boys R, Hodgkin M, Kinsey S (2011) A home-based maintenance therapy program for acute lymphoblastic leukemia—practical and safe? *J Pediatr Hematol Oncol* 33:433–436
9. Taylor J, Winter L, Geyer L, Hawkins D (2006) “Medication errors in children with acute lymphoblastic leukemia” American Cancer Society
10. Kelly K, Wells D, Chen L, Reeves E, Mass E, Camitta B, Hinds P (2014) Caregiving demands and well-being in parents of children treated with outpatient or inpatient methotrexate infusion: a report from the Children's Oncology Group. *J Pediatr Hematol Oncol* 36: 495–500
11. Duderstadt K Medical home: nurse practitioners' role in health care delivery to vulnerable populations- PlumX Metrics
12. Chicoine V, Aselton P (2015) Nurse practitioner role in home healthcare: challenges and opportunities- December 17, 2014 *Clinical Nursing Studies*, Vol. 3, No

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.