PNDU
Parenteral Nutrition Down Under

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Member survey of HPN infusion pumps

Dear PN hospital/homecare company

At PNDU we are very grateful for the PN hospitals and homecare companies here in Australia and New Zealand that are committed to the highest standards of Parenteral Nutrition services and production, as well as provision of world-class equipment and supplies. As the patient organisation supporting and representing the small group of adults and children living with Intestinal Failure and Home Parenteral Nutrition (HPNers) in Australia and New Zealand, we continue to advocate for equity and access to such world-class services, equipment and supplies for all Aussie and Kiwi HPNers. As such, we are keen to share the results of a recent member survey of HPN infusion pumps.

The survey of 29 members, although not statistically valid in terms of the total Australian and New Zealand HPN patient group, nonetheless serves as a useful snapshot and highlights some matters regarding current HPN infusion pumps. It is our hope that this snapshot of the current situation can assist our hospitals and homecare companies in their HPN infusion pump considerations and general provision and maintenance.

We attach the analysis of our survey and would like to draw attention to a few excerpts from the Discussion section:

1. ***Pump under/over infusing***: *"Around a third of users experienced problems with the pump either over or under infusing. According to the Bodyguard 323 manual (1) the expected infusion error is +/- 5% under laboratory conditions... Some respondents estimated the error of their pump to be at least 10% which could amount to a significant volume of PN if 'under' infusing. While some users could then reset the infusion to finish the PN this is inconvenient and may create problems for those who ramp down towards the end of their infusion."*
2. ***Pump not alarming air in line***: *"Just over a quarter of those surveyed reported their pump did not alarm when there was air in the line. The acceptable amount of air detected by the Bodyguard 323 pump before the alarm sounds is 1mL of bubbles cumulative over 15 minutes (1) with acceptable individual bubble size usually set at 0.5mL for adults and 0.2mL for children. While this may translate into some centimetres in the giving set, air filling the entire line results in over 1.5 metres. This is unacceptable and potentially dangerous, and should be reported to the provider and ultimately the pump manufacturer for attention."*
3. ***Annual pump servicing and calibration***: *"most respondents did not have their pumps recalled regularly. This is despite one of the pump providers noting in their patient guide that pumps issued by them would be recalled annually for a safety and service check (2)."*
4. ***Pump battery life***: *"Limited battery life was identified as a problem. The BodyGuard 323 manual (1) states the rechargeable battery should last for 20 hours at an infusion rate of 125 mL/hr and should be replaced every 2 years. Considering the long infusion times for most of the HPN users*

and most likely in many cases faster infusion rates than 125 mL/hr a second battery seems an essential accessory for the pump."
While the patient guide issued by a pump provider implies that the pump should be plugged into AC power while sleeping (i.e., when not mobile) (2), some users may find this inconvenient or not possible and negates the full benefit of having a portable pump. Portability of the infusion pump is essential for the user.

5. ***Backpacks and wheel attachments**: "Most HPNers used a backpack at some time during the infusion. However, weight was identified as a problem. As this is mostly due to the large volume of the PN some respondents thought the addition of detachable wheels would be helpful. Further, given the different size of the PN bags used and the different size of the user (adult versus child) an individual customised backpack or at least a more readily adjustable backpack may be beneficial."*

Reporting of problems and faults

While we continue to encourage our members to report any and all problems and faults to their hospital/homecare company, including infusion pump problems, we are alarmed by the number of this survey cohort reporting problems with over/under infusing, no pump alarming for air in line, and limited battery life. We therefore wonder how much reporting is actually occurring firstly to hospitals, and then back to the homecare company? In light of this possible under-reporting, PNDU would like to suggest the exploring of ideas to make the reporting easier and more streamlined? Are there ways in which reporting of problems and faults could be made easier and also essential for both HPN patients/carers as well as HPN clinicians? PNDU is happy to explore ideas with hospitals and homecare companies at any time eg an on-line reporting form on hospital or homecare company website.

Annual pump servicing and calibration

Our findings are that over half of respondents did not have their pump recalled annually for calibration and servicing, and it was not clear how many of the remainder had it organised by the homecare company, their hospital or themselves. It would seem this is a matter that could easily be rectified by an electronic system of record-keeping which provided reminders to technical staff to contact appropriate HPN patients/carers to organise pump servicing and calibration. This together with regular battery replacement and the provision of a second battery for all users would potentially alleviate the battery life problems being experienced and which in themselves significantly limit mobility.

Backpack sizes and detachable wheels

And lastly, as our survey shows, many HPN patients experience difficulty carrying a backpack with PN and pump due to the weight and for some, particularly children, also the size. As a result, many continue to use the dripstand for at least some of the infusion time. This hampers mobility considerably and can create its own dangers in the home environment where floor coverings and home layouts are not necessarily suitable. As more products are now available to assist HPN patients with mobility, including detachable backpack wheels and different size backpacks, we strongly support the availability of these items to HPN patients and believe that they can have a significant impact on the quality of life, safety and independence through mobility of many HPN patients.

As said at the start, our aim in sharing these survey results is to be able to share a snapshot of HPN patient experiences and we hope this information will be of benefit to hospitals and homecare companies. If there are any questions or suggestions on how we can collaborate on this matter or any other matter for the benefit of HPN patients and carers, please don't hesitate to let us know.

The Management Committee
Parenteral Nutrition Down Under Inc.

Survey of infusion pump usage for Home Parenteral Nutrition in Australia and New Zealand

ABSTRACT

Members of the Parenteral Nutrition Down Under (PNDU) online forums were invited to complete a questionnaire about use of parenteral nutrition (PN) infusion pumps. Twenty-nine home parenteral nutrition (HPN) users or their carers (representing 19 adult and 10 child HPN users) participated. Twenty-seven (93.1%) respondents used Bodyguard 323 pumps of which 25 were provided by Baxter Healthcare. Ten (34.5%) respondents experienced problems with their pump either over or under infusing and eight (27.6%) reported the pump not alarming when there was significant air in the line. Sixteen (55.2%) respondents reported their pump battery did not last for the duration of the infusion when off the charger. Respondents did not always notify the pump provider of problems and more than half did not have their pump recalled annually for servicing. Only 4 (13.8%) respondents did not use an IV pole during set up or infusion but 23 (79.3%) used a pump backpack for at least some of the time. Fifteen of these thought a backpack with detachable wheels would be beneficial mainly because of the weight of the PN. This survey highlighted some of the issues faced by HPN users and should be considered when transitioning from hospital to HPN.

AIM

To survey a sample of home parenteral nutrition (HPN) users about their use of and problems experienced with infusion pumps.

METHOD

All members of the Parenteral Nutrition Down Under (PNDU) online forums were invited to participate in the survey. The survey involved completing an online questionnaire consisting of closed and open questions asking about parenteral nutrition infusion pumps. The survey took place during the month of June 2016.

RESULTS

Respondents

There were 29 respondents. Nineteen (65.5%) respondents were adult HPN users or their carers and 10 (34.5%) were carers of child HPN users (3 aged 5-9 years, 7 aged < 5 years) (Fig.1).

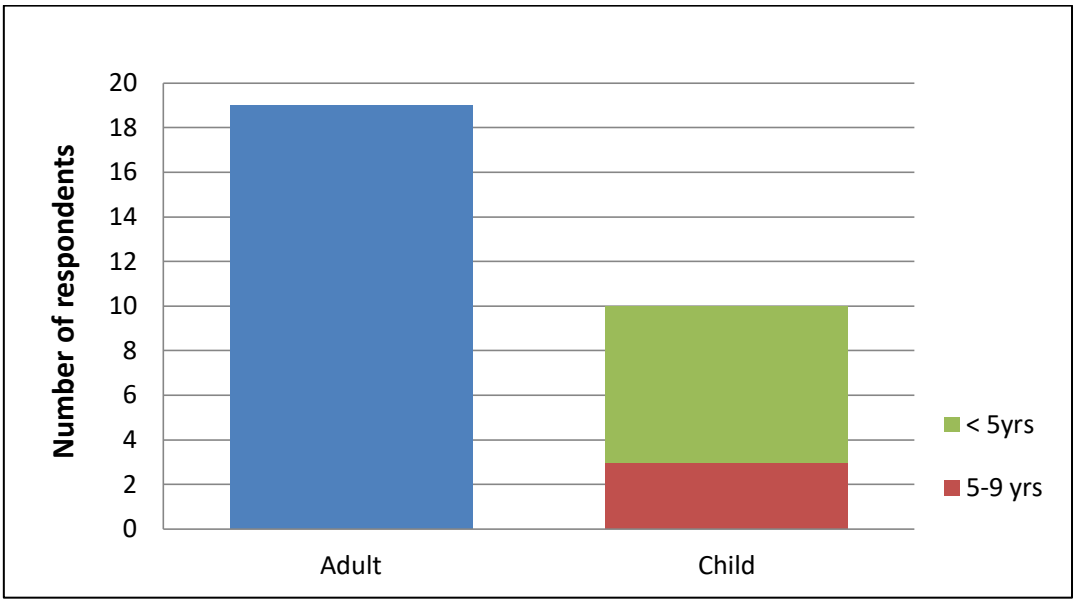

Fig. 1. Age of HPN user versus number of survey respondents

Provider and pump type

Twenty-seven (93.1%) respondents used Bodyguard 323 infusion pumps of which 25 were provided by Baxter Healthcare, one by the treating hospital and one by Biomed Limited. In addition, Baxter Healthcare provided a Colleague 3 channel pump to one adult and the treating hospital provided the CADD Solis VIP to another adult.

Pump problems

Over or under infusing

Ten (34.5%) respondents experienced problems with their infusion pump either 'over' or 'under' infusing (over infusing referred to infusing the set volume in a shorter time than expected, and under infusing referred to having a significant volume of PN remaining after the set infusion time). Nine of those pumps showing problems were Bodyguard pumps, 2 of which were used by children, and the other the Colleague 3 channel pump. While the problems were not always persistent, one Bodyguard pump tended to over infuse and 6 under infuse. The remaining 2 Bodyguard pumps and the Colleague 3 channel pump had at some time both over and under infused (Fig.2). Three respondents estimated the infusion error to be at least 10%. Other respondents noted under infusing by volumes of around 100-200mLs, 300mLs, and 600mLs. The infusion rates set were not stated. Not all HPN users experiencing these problems had informed their pump provider. However, when they had, the response was to replace the pump.

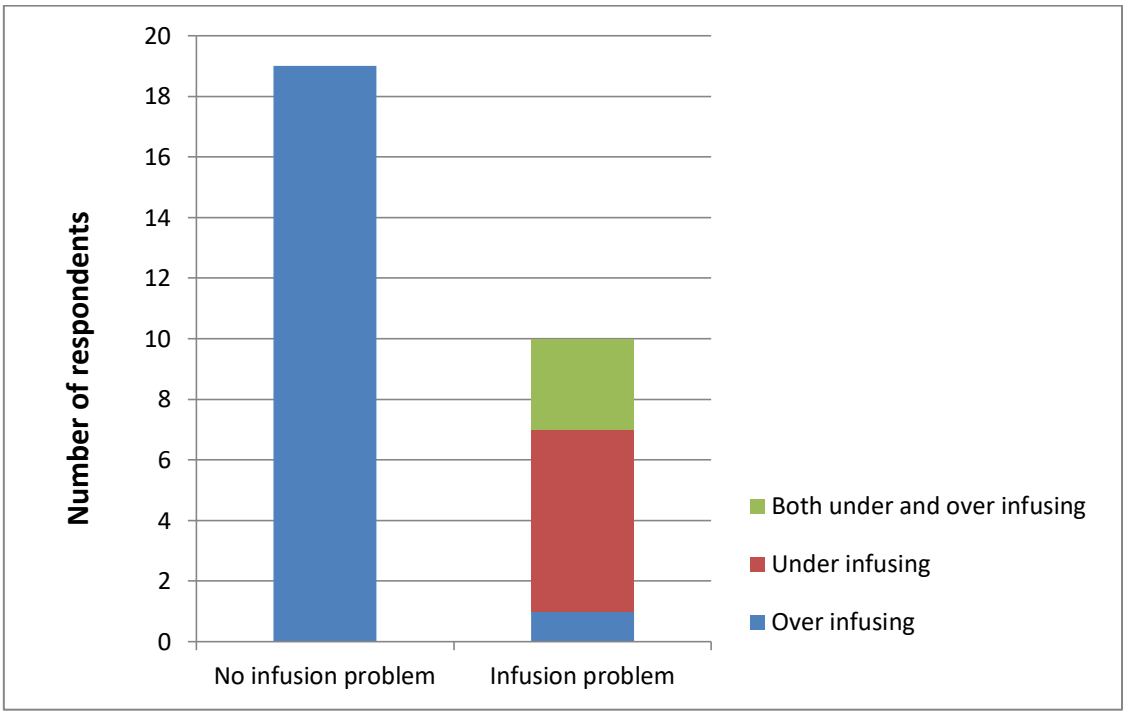

Fig. 2. Number of respondents versus pump infusion problem

Pump not alarming when air in line

Eight (27.6%) respondents reported the pump not alarming when there was air in the line. However not all reported this to their pump provider. The pumps were all Bodyguard pumps with 4 used by adults and 4 used by children. Four respondents reported their worst cases occurred when either the entire or close to entire giving set line was full of air.

Battery life

Sixteen (55.2%) respondents reported their current pump battery did not last for the duration of the infusion when off the charger. This included the Colleague 3 channel, CADD Solis VIP and 14 Bodyguard pumps with 7 of the latter being used by children. Twelve of the 14 respondents using the Bodyguard pumps reported they infused for at least 12 hours (range 12-24 hours). The infusion time with the CADD Solis VIP was 14 hours. The respondents' estimations of their pump battery life varied ranging from around 6 hours to 12 hours before recharging was necessary. Infusion rates were not stated. Most respondents kept the pump on the charger for at least some of the infusion time because of the limited battery life.

Pump servicing

Three respondents had their pumps for less than 12 months. Of the other 26 respondents, 15 (57.7%) did not have their pump recalled annually for calibration and servicing (13 Bodyguard, Colleague 3 channel, CADD Solis VIP pumps). However, of the other 11 respondents it was not clear whether the provider actually recalled the pump for annual servicing or whether the user initiated this service and the provider then organised it. Six of the 11 respondents noted either themselves or their hospital as organising the service with only 5 respondents indicating Baxter organised the annual recall.

Use of IV pole

Four (13.8%) respondents did not use an IV pole, 5 (17.2%) used an IV pole for set up only and the remaining 20 (69%) used the pole throughout the infusion, including all 10 children (Fig.3). Of those 20

who used the pole throughout the infusion, 10 reported mobility or safety concerns while using it. These issues included the wheels not turning well, the small wheels not transitioning well between different floor surfaces, not being able to easily go outside or upstairs, the pole tipping over and the IV pole being top heavy which one respondent thought made this unsafe for a child.

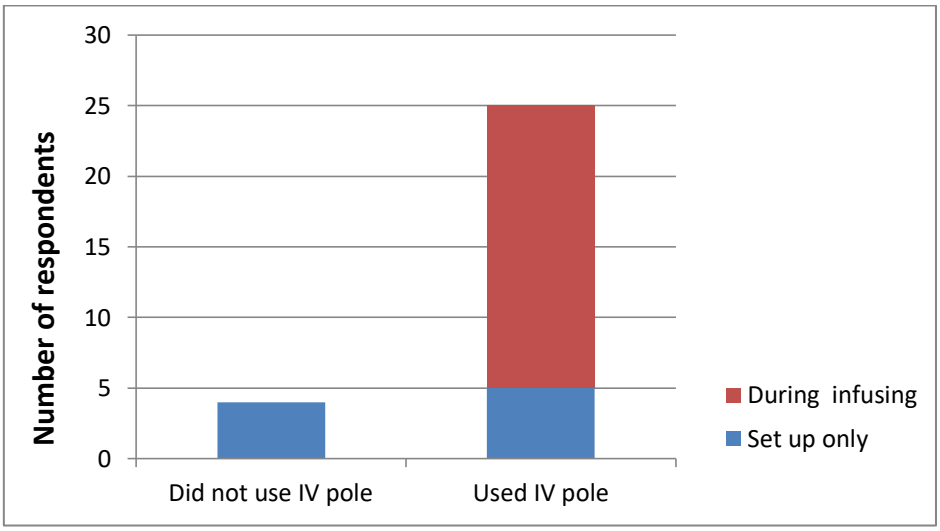

Fig. 3. Number of respondents versus use of IV pole

Use of backpack

Twenty-three (79.3%) respondents used a pump backpack for at least some of the time during the infusion (17 of 19 (89.5%) adults and 6 of the 10 (60%) children) (Fig.4). Nineteen (82.6%) of these 23 used the backpack issued by the pump provider, including one who also used their own. A further 4 provided their own. Reasons for doing this included the supplied backpack; caused back pain, was too heavy and big for children, and generally not being suitable. Only two respondents (carers of children) indicated that a physiotherapist or an occupational therapist had been involved in fitting or attempting to adapt the backpack.

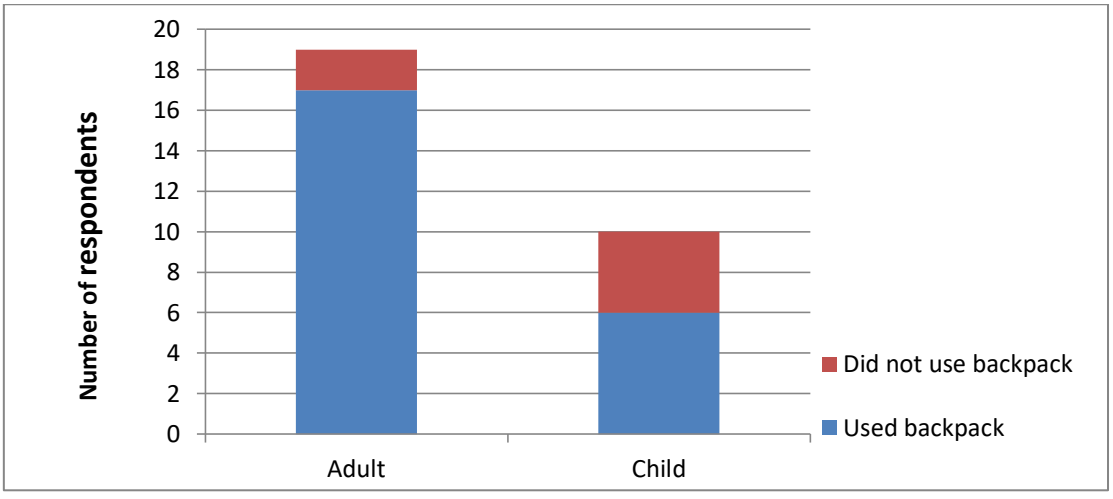

Fig.4. Number of respondents versus backpack usage by adult and child HPN users

Of the 23 who used a backpack 6 (26.1%) used additional aids with the backpack to aid with mobility. These included trolleys, a walking stick and having someone else to carry the backpack for them.

Reasons for not using any backpack were similar to why some used their own rather than the supplied one. One carer of a child did not find a backpack easy to use and 3 others thought backpacks with PN

were too big and heavy for children. There was also a problem attaching the charger while using the backpack. One adult had not yet received a backpack while one adult used the Colleague 3 channel pump which was thought to be too big and heavy for a backpack.

Fifteen (65.2%) who currently used a backpack (including 4 of those who currently used additional aids) thought a custom made backpack with detachable wheels would assist them. A further five who did not currently use a backpack for PN also agreed that a custom made backpack would assist. It was thought that this would help those dealing with heavy packs and would keep the backpack upright when not being worn.

All 18 respondents who recorded the PN infusion volume infused at least 1 Litre (range, child 1-3.1 L, adult 1-3.2 L) over a 24 hour period (Fig. 5).

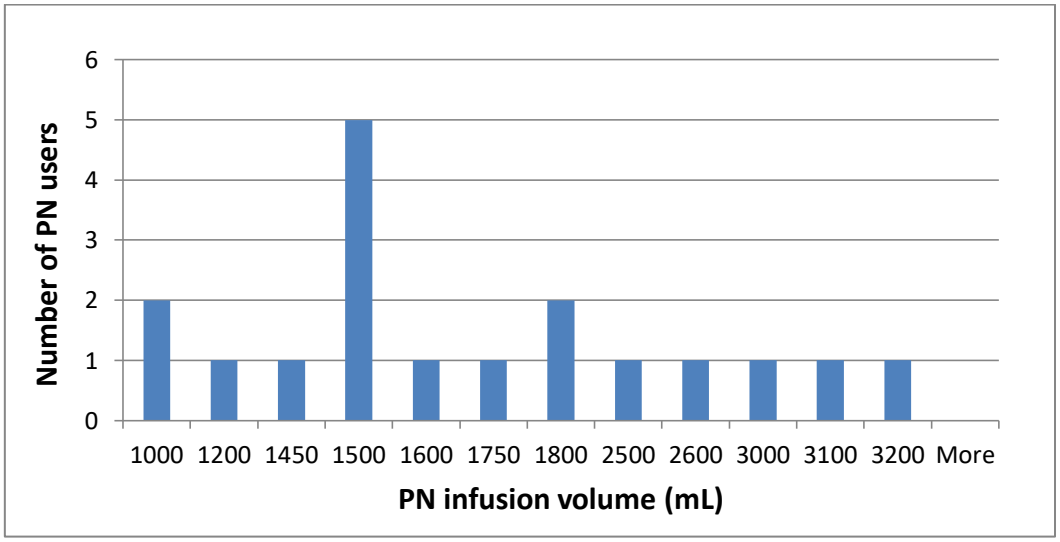

Fig. 5. Number of PN users versus PN infusion volume

Additional comments by respondents

Ten respondents provided additional comments relating to their PN pump. These included:

- having to buy at their own expense an additional pump charger,
- care needed when tightening the charger onto the pole or else the charger sides crack,
- the Bodyguard pump is a bit noisy and no way to dim the light coming from the display except by covering it,
- more choice would be great,
- a 12v plug in charger would be helpful,
- alarms aren't loud enough,
- current pump makes an audible ticking noise which is irritating,
- alarms even for very small air bubbles,
- consistent training on use of pump would be helpful,
- problems attaching the charger when using the backpack overnight. A back up battery would be useful when power outages occur.

DISCUSSION

An infusion pump is an essential piece of equipment for the HPN user and may contribute to either a positive or negative transition from hospital to home PN. The pump needs to be safe, consistently reliable

and portable to make it easy for the user. In this survey a sample of HPN users were asked about their usage of infusion pumps.

The Bodyguard 323 was the most frequently used pump and most commonly supplied by Baxter Healthcare. Around a third of users experienced problems with the pump either over or under infusing. According to the Bodyguard 323 manual (1) the expected infusion error is +/- 5% under laboratory conditions. However it is possible that the accuracy of the pump may depend on ambient temperature or may depend on the infusion rate used. Infusion rates used were not recorded in the survey. Some respondents estimated the error of their pump to be at least 10% which could amount to a significant volume of PN if 'under' infusing. While some users could then reset the infusion to finish the PN this is inconvenient and may create problems for those who ramp down towards the end of their infusion.

Just over a quarter of those surveyed reported their pump did not alarm when there was air in the line. The acceptable amount of air detected by the Bodyguard 323 pump before the alarm sounds is 1mL of bubbles cumulative over 15 minutes (1) with acceptable individual bubble size usually set at 0.5mL for adults and 0.2mL for children. While this may translate into some centimetres in the giving set, air filling the entire line results in over 1.5 metres. This is unacceptable and potentially dangerous, and should be reported to the provider and ultimately the pump manufacturer for attention. Perhaps a more comprehensive and regular servicing including calibration of the pump is required. However, most respondents did not have their pumps recalled regularly. This is despite one of the pump providers noting in their patient guide that pumps issued by them would be recalled annually for a safety and service check (2).

Limited battery life was identified as a problem. The BodyGuard 323 manual (1) states the rechargeable battery should last for 20 hours at an infusion rate of 125 mL/hr and should be replaced every 2 years. Considering the long infusion times for most of the HPN users and most likely in many cases faster infusion rates than 125 mL/hr a second battery seems an essential accessory for the pump.

While the patient guide issued by a pump provider implies that the pump should be plugged into AC power while sleeping (i.e., when not mobile) (2), some users may find this inconvenient or not possible and negates the full benefit of having a portable pump. Portability of the infusion pump is essential for the user.

Most HPNers used a backpack at some time during the infusion. However, weight was identified as a problem. As this is mostly due to the large volume of the PN some respondents thought the addition of detachable wheels would be helpful. Further, given the different size of the PN bags used and the different size of the user (adult versus child) an individual customised backpack or at least a more readily adjustable backpack may be beneficial.

It is unknown whether these survey results can be generalised to the HPN community as a whole. However, they do highlight the potential challenges faced by people on home parenteral nutrition and should be taken into consideration when the PN user makes the transition from hospital to home PN.

ACKNOWLEDGEMENTS

We thank all those who participated in this survey.

REFERENCES

1. Caesarea Medical Electronics. BodyGuard 323 Infusion Pump System Operator Manual, 2013.

2. Baxter Healthcare Pty Ltd. Parenteral Nutrition At Home Patient Guide, Ref: ANZ/MG17/15-0002