

# Postgraduate Institute of Medical Education and Research, Chandigarh



Patient safety

## IV ALERT: Low cost indigenous alarm system for monitoring of intravenous infusions



Prof GD Puri

Department of Anaesthesia

PGIMER, Chandigarh

**Patent** Application number : 201611029938

## PGI doctor's IV drip alarm beeps thrice before fluid ends

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**Chandigarh:** Now, no more dependency on an alert doctor or nurse in any hospital's emergency for the intravenous (IV) drip. A short nap by healthcare workers can cost a life, as when the drip of fluid or medicine gets emptied, it can create complications due to blood clot. A Post Graduate Institute of Medical Education and Research (PGI) professor has developed an IV infusion alarm which warns hospital staff three times before the required amount of fluid gets over.

An Indian patent has been filed for the IV infusion alarm, and there has also been a transfer of technology for its commercialization

Shimona Karwar



The IV infusion alarm has been developed by Dr G D Puri, head of dept of anaesthesia, PGI

by a Mohali-based company. "It is not possible to be vigilant in every bed of the emer-

gency ward or operation theatre. We had been working on this problem since last year and came up with this alarm, which has been commercialized," said Dr G D Puri, head of the department of anaesthesia, PGI.

Elaborating on the complications of an unnoticed intravenous drip, he said: "There is a reverse flow of blood from the IV if it gets empty, which results in a clot that can be risky for sick patients." The alarm can be hooked on to any IV stand, and can be set according to the volume of the fluid or medicine. The minimum volume is 50ml, and the maximum is two litres. The alarm beeps three times to warn the staff.

► Continued on P 3

# Corridor of creativity: Medical innovations by patients, doctors and nurses

📅 July 13, 2016 👤 admin 📁 General

No matter how empathetic a delivery system, there is always a scope to do more, to do better and to think farther. During my recent visit to Postgraduate Institute of Medical Education and Research, Chandigarh for a foundation day lecture on Doctors as Designers of an inclusive healthcare system, I learnt so much about the innovations involving patients, their wards, nurses and other staff as co-creators. Somehow, the intellectuals tend to take over far too much responsibility of thinking and doing. We ignore the contribution grassroots workers within and outside an organisation can make towards a very creative and innovative ecosystem.

During the informal interaction with the Director, Dr. Yogesh Chawla, Dean, Dr. Arunaloke Chakraborti, innovative students and faculty, it was learnt that despite being a premier institute of tertiary research and practice of medical science, PGIMER received about 10000 patients every day. The more caring they were, more demands were made on them from the entire region. I was keen to know whether doctors and patients together had developed some innovative solutions.

What Dr.G.D.Puri shared is not only an inspiring one but also very relevant for all other hospitals which would wish to learn





# First prize at “Innopharm2-Vigyan Bhawan, Bhopal 11<sup>th</sup> to 12<sup>th</sup> Feb , 2017) “ Evaluation of accuracy of IV ALERT”


**Evaluation of accuracy of IV ALERT**  
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## INTRODUCTION

- Traditionally, intravenous (IV) fluid is fed, under gravity, from an infusion bottle.
- There are several existing technology to deliver and measure the volume of IV fluid. However, these technology are sophisticated and relatively costly (Figure 1).
- In developing countries like India, an indigenous, cost effective and user friendly alarm system to monitor the infused volume of IV fluid is a current need.
- Recently, we invented a system called “IV ALERT” (Figure 2) that sounds alarm at completion of 80%, 90% and 100% of pre-set target volume of IV fluid (Patent application no 201611029938). IV ALERT uses high accuracy strain gauge that measures the weight of a hanging object.



Figure 1 showing Modern Infusion pump



Figure 2 showing IV Alert, invented at PGIMER

## AIMS & OBJECTIVES

- To evaluate the accuracy of IV ALERT using Normal Saline (NS), Ringer's Lactate (RL), 5% Dextrose (D5) and Dextrose Normal Saline (DNS).
- This study was approved by Institutional Ethics Committee (NK/3106/STUDY).

## MATERIALS & METHODS

- Accuracy was studied using 190 cases that included 155 NS, 5 RL, 14 D5 and 16 DNS with varying target volume as illustrated in table 1.
- 80 %, 90% and 100% of the Target volume was calculated as  $T_{80}$ ,  $T_{90}$  and  $T_{100}$ .
- IV bags with NS/ RL/ D5/ DNS were hanged to IV ALERT. Infusion set was attached to the bag. The fluid was allowed to drain in the volumetric cylinder. Final drained volume at 80% ( $F_{80}$ ), 90% ( $F_{90}$ ) and 100% ( $F_{100}$ ) sound alert was measured and noted.
- All the data were presented as Mean  $\pm$  Standard deviation (SD) or number of observation (N) whenever needed. Percentage Errors (PE) at 80%, 90% and 100% were calculated as,

$$PE_{80} = \frac{F_{80} - T_{80}}{T_{80}} \quad PE_{90} = \frac{F_{90} - T_{90}}{T_{90}} \quad PE_{100} = \frac{F_{100} - T_{100}}{T_{100}}$$

Table 1. Target volume of IV fluids

TARGET VOLUME	IV FLUIDS			
	NS	RL	D5	DNS
50 ml	N= 46	N= 1	N= 8	NA
60 ml	N= 20	NA	NA	NA
70 ml	N= 24	N= 2	N= 1	NA
80 ml	N= 16	N= 2	N= 5	NA
90 ml	N= 10	NA	NA	NA
100 ml	N= 23	NA	NA	N= 16
110 ml	N= 11	NA	NA	NA
120 ml	N= 1	NA	NA	NA
150 ml	N= 1	NA	NA	NA
200 ml	N= 3	NA	NA	NA

## RESULTS

The percentage errors (PE) at 80%, 90% and 100% of NS, RL, D5 and DNS are illustrated in figure 3.

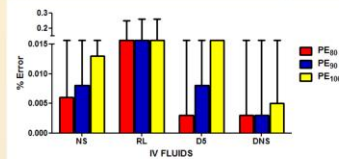


Figure 3 showing percentage error of IV fluids at 80%, 90% and 100%

Overall, the % error at 80%, 90% and 100% alarm was  $0.007 \pm 0.07$ ,  $0.009 \pm 0.07$  and  $0.015 \pm 0.06$  respectively (Figure 4).

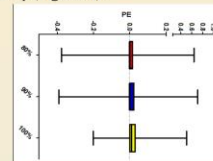


Figure 4 showing overall percentage error at 80%, 90% and 100%

## DISCUSSION

The percentage error was negligibly small (less than 0.02%) at all the 3 alarm points using any of the 4 IV fluids. Over in all, the percentage error was maximum at 100% alarm point followed by 90% alarm point and the least at 80% alarm point.

## CONCLUSION

- IV ALERT is highly accurate that measures an accurate volume of infused IV fluids.
- IV ALERT is cost effective (Estimated Selling price is 5000 Irs. Vs. >50000 Irs )
- IV ALERT can prevent medical errors arising from transfusion of more than desired IV fluid volumes.
- Reduces preventable causes of morbidity and mortality & Increases Patient Safety.
- Decreases workload of the Allied Health Care Workers & Nursing Staff.
- Deployable in peripheral centers, emergencies wards, field areas, OT, ICU, CCU.

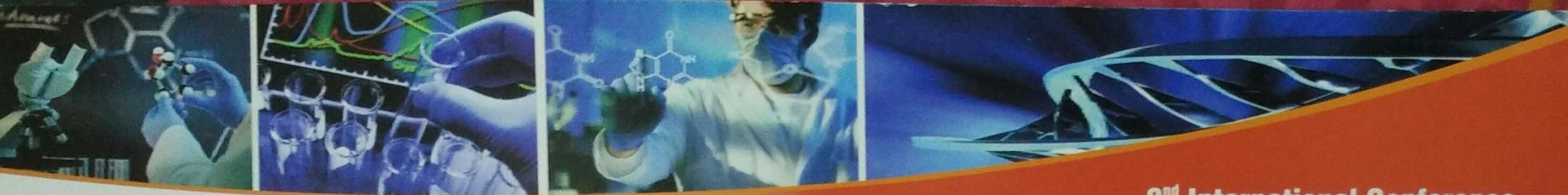
## ACKNOWLEDGEMENT

- We would like to acknowledge department of Science and Technology (DST) and Clarity Medical Pvt. Ltd.

## REFERENCES

1. Hkhkah

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2<sup>nd</sup> International Conference  
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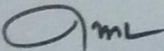
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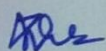
For paper entitled


"IV ALERT" (EVALUATION OF ACCURACY OF IV ALERT).....

at the 2<sup>nd</sup> International Conference on **Bridging Innovations in Pharmaceutical, Medical and Bio Sciences**  
organised by **Innovare Academic Sciences** in association with **Paramita Health Care Society**  
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Prototype showcased at  
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