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Trigger Tools for Monitoring and Reporting of Adverse Drug Reactions A Scientific Tool for Efficient Reporting

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Abstract

Background: Adverse drug reactions (ADRs) are the leading cause of morbidity, mortality and increased healthcare cost. A new scientific tool has been developed to monitor and report ADRs. Trigger tool is one of the active data collection process which triggers to identify the ADR in a quicker fashion. The objective of our research was to study and assess the trigger tools for detection and analysis of ADRs.

Method: This prospective study was conducted in internal medicine department of a tertiary care hospital for duration of 3 months. Patients aged ≥ 18 years of either gender admitted were included. Subjects treated on OPD basis, emergency cases, and ICU cases were excluded. Patients and their medical records were reviewed for trigger tools (if any) to monitor and further report ADRs.

Result: A total of 220 subjects were enrolled into the study. Out of them, 40 subjects experienced 93ADRs. Eighty three trigger tools were identified in 40 subjects. Out of which, 63 trigger tools were utilized to report 80 (86.02%) ADRs. The incidence of ADRs was found to be 18.1%. Male 132 (62.85%) preponderance was observed over females 88 (41.90%). Polypharmacy (67.74%) was one of the most prominent predisposing factors reported. Majority of ADRs were found to be of probable 64 (68.8%) in nature. On severity analysis, 21 (22.5%) ADRs were of moderate (Level3) severity and 75 (80.6%) were probably preventable.

Conclusion: Our results showed incidence of 18.1%. Trigger tools proved to be one of the best scientific tool in identification and reporting of ADRs in our study. Scientific validation of trigger tools is required to further utilize in large scale studies.

Keywords: Trigger tool; Adverse drug reactions

Abbreviation: ADR: Adverse Drug Reaction; NCCMERP: National Coordinating Council for Medication error Reporting and Prevention; IOM: Institute of Medicine; ADE: Adverse Drug Event; AE: Adverse Event; WHO: World Health Organization; IEC: Institutional Ethics Committee

Introduction

Adverse drug reactions (ADRs) are the leading cause of morbidity, mortality and increased healthcare cost [1-4]. Despite of drastic improvement in healthcare practices, ADRs are contributing towards poor clinical outcome, hospitalization, prolongation of hospital stay, and enhanced economic burden [5-8].

The mishaps like medication error occurs frequently and portrays a real image of adverse effects at a rate comparative to the growing population of India [9,10]. Along with multiple uses of drugs or multiple complications; inappropriateness in the dosage or dose interval makes patient care contraindicated in all way around. The National Coordinating Council for Medication error Reporting and Prevention (NCCMERP) defines medication error as "any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professionals, patient or consumer" [11-14].

Americans are injured every year by medication error in hospitals, nursing homes and doctor's offices (IOM 2006) which puts impairment of trust from the Health care professionals. It should be preventable by definition through education and effective system controls involving pharmacists, prescribers, nurses, administrators, regulators and patients [15,16].

Adverse drug reaction detection continues to be an important tool for ensuring patient safety [17,18]. An ADR is a harmful response in the patient caused by the drug itself given in the recommended manner (dose, frequency, route, and administration). For example, allergic reactions effect from withdrawal or reactions caused by interactions with other medications. An Adverse event (AE) defines as "any untoward occurrence that may present during treatment with a pharmaceutical product but which does not necessarily have a causal relation to the treatment [2,4,7,8,19].

Who defines a serious ADR "as any reaction that is fatal, life-threatening or permanently or significantly disability, requires or prolongs hospitalization or relates to misuse or dependence". Improvements in the ability to precisely identify ADR include thorough review of patient medication order, prognosis, anti-dote and while readmission.[19] The concurrent or real time evaluation of triggered alerts has been used to guide clinical interventions to prevent emerging ADR and mitigate actual ADRs [20].

In terms of indentifying the medical error and adverse events in both the adults and pediatric, traditionally many of the systems have been adopted including chart review, voluntary reporting by health

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care providers, direct observation, and review of medical malpractice claims [21]. However, it is estimated that only 10% to 20% of errors are reported this way and of those, about nine out of 10 cause no harm to patients [22]. To overcome all these problems there is a need of more effective method that can prioritize area for improvement. The use of triggers promotes a more focused and efficient chart review than an unfocused chart review and thus may identify more adverse drug events. When anything happens to the patient in terms of medical error, laboratory or clinical parameters disruption, necessary steps are taken to improve patient care process and continue rapid review till discharge to see changes over time [23-29].

A trigger is defined as an "occurrence, prompt or flag found on review of the medical record that 'triggers' further investigation to determine the presence or absence of an adverse event" [30-32]. A trigger may include Lab trigger, Medical trigger, and Clinician trigger [33-35].

An ADE trigger tool makes chart review more efficient by identifying suspected AE via laboratory values, text phrases or automated 'values' available in medical records, which is more time effective than complete chart review and more sensitive than voluntary reporting [35]. Therefore, the use of triggers promotes more focused chart review and thus may help to identify ADRs [36].

This study is undertaken to utilize the existing trigger tools in practice for identification of ADRs and also to develop and validate new trigger tools for effective monitoring and reporting of ADRs. The main objective of the research is to study and assess the trigger tools for detection and analysis of ADRs. Secondary objectives of the research are to identify trigger tools likely to provoke ADRs, to develop new trigger tools, to analyze reported ADRs using standard scales (causality, severity and preventability).

Material and Method

Study setting

It is a tertiary care teaching hospital which is providing healthcare services to patients in and around Belgaum district. It is a prospective surveillance and observational study, data collected for 3 months, analyzed in 1 month.

Inclusion criteria of the study, Subjects aged ≥ 18 years of either gender admitted to medicine wards and who agree to participate voluntarily with written consent form and those who refused to participate, or admitted to intensive care units or emergency department or visiting on OPD basis and likely to withdraw or lost to follow up as per discretion of investigator are excluded from the study.

Procedure

Ethical clearance has been obtained from institutional ethics committee (IEC) before initiating the study. Informed consent (in vernacular language) will be administered by the investigator to the subjects (based on inclusion/exclusion criteria) before enrolment in the medicine department for specified period. Trigger tools developed by researchers will be utilized by investigator for the detection, monitoring, reporting and analysis of ADRs. New trigger tools will also be developed during the study period. Subjects will be intensively monitored for the occurrence of ADRs and identification of trigger tools. Suspected ADRs will be notified and documented in a specified format (designed for study purpose) after discussion with physicians.

Subjects will be regularly monitored from the day of admission till discharge. Reported ADRs will be characterized based on demographics, drug class implicated, organ system affected, reaction occurred, management and outcomes aspects, treatment, de-challenge, re-challenge, and analysis of ADRs using standard scales for causality (WHO probability scale), severity and preventability (Modified Schumock and Thornton scale). Adverse drug reaction information will be discussed with physicians in internal medicine department to know their opinion regarding utilization of trigger tools in clinical practice. Suggestions would be considered (if appropriate) for implementations of developed ADR trigger tools.

Results

A total of 220 subjects were enrolled into the study. Out of them, 40 subjects experienced 93ADRs. Eighty three trigger tools were identified in 40 subjects. Out of which, 63 trigger tools were utilized to report 80 (86.02%) ADRs. The incidence of ADRs was found to be 18.1%. Male 132 (62.85%) preponderance was observed over females 88 (41.90%). Poly-pharmacy (67.74%) was one of the most prominent predisposing factors reported. Majority of ADRs were found to be of probable 64 (68.8%) in nature (Figure 1). On severity analysis, 21 (22.5%) ADRs were of moderate (Level3) severity and 75 (80.6%) were probably preventable.

Management and outcome of ADRs

The ADR is managed in various ways for the better outcome of patient for that Physician, Nurses and clinical pharmacists are involved in and out day over time. In our study an investigator (Clinical Pharmacist) involved over a time with the respected unit Physician and PG (students) that gives management of ADRs data as Drug Withdrawn (53, 56.9%) followed by the No Change in medication (36, 38.7%), Dose Altered for suspected drug (4, 4.3%). Outcome of the following subjects for the suspected ADRs are 52 of the subjects recovered (55.9%) followed by the continuing of the reaction (28,

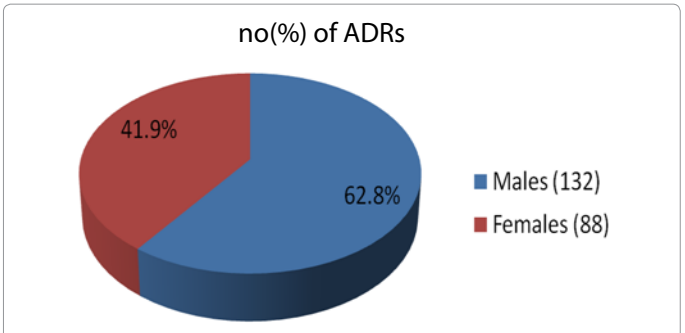

Figure 1: Gender related ADRs.

Reactions occurred	Number (%) of ADRs
Hypotension	28(30.1)
Rise in Liver enzymes	11(11.8)
Hypertension	8(8.6)
Hypoglycaemia	5(5.3)
Loose stools	5(5.3)
Multiple Erythematous	5(5.3)
Constipation	5(5.3)
Others (vomiting, chills and rigors, osteoporosis, Hand Tremors, yellow vision, tachycardia, Thrombophlebitis, high RBS, High FBS, pedal oedema, etcetra)	27(29.03)

Table 1: Reaction occurred.

30.1%) and 13 (13.9%) were unknown due to lots of follow-up or discharge (Table 1).

Treatment

Subjects who are enrolled during the study for the suspected ADRs are treated for the better outcome in terms of health, medication related burden to give the disease free environment. The Specific treatment provided to the suspected ADRs was (38, 40.8%), maximum are given No treatment (48, 51.6%) and lastly symptomatically treated subjects are 7 (7.5%).

Discussion

Incidence of ADRs

The incidence of ADRs calculated over the study period of time was 18.1% and that was a good number to overcome the traditional reporting system of ADRs which was greatly compared to the other studies done by the Vora et al. (5.42%), Arulmani et al. (9.8%) and Sinha et al. (3.31%) [37-40].

The reason for increase in the incidence of ADR was due to the use of Trigger tool reporting system that was largely supported by the authors all over wide across the world like Classen et al., Rozich et al., Sarkar et al., Takata et al., and one of the study by Pinney et al., in Surgery stated that the trigger tool uncovered AEs in 14.6% of patients [30,31,35,41,42].

Demographics

Vor et al., showed that in internal medicine males and females incidence rate were 3.37% and 2.05% respectively and a similar type of study showed reason of admission due to ADR is higher in female (57%) than male (43%) [37]. Arulmani et al., showed higher incidence of rate in females (78, 64.5%) than males (43, 35.5%) [38]. An Indian study by Gor et al., stated that sex of the patient does not affect the incidence of ADR [39]. In state of the above data our study resulted in Male 132 (62.85%) preponderance over females 88 (41.90%).

Predisposing factor

Poly-pharmacy (67.74%) was one of the most prominent predisposing factor reported in the study that was similar to the other study done by the Fattinger et al., [43]. The other predisposing factors which are contributed in the study are Inter current disease (51, 31.48%), Age (23, 14.1%), Gender (7, 4.3%) and others (6, 3.7%).

Drug class implicated

In one the study by the by Vora et al., showed that the Anti-microbial agents cause maximum of ADR (40.43%) which equally proved by the other author Arulmani et al., Anti-microbial agents (44, 17.0%) followed by Anti-hypertensive agents (25,14.3%) [37,38].

Sinha et al., showed that the most common drugs associated in the ADR are Anti-hyperglycemias agents, anti-hypertensive, chemotherapeutic agents and insulin [40]. Major of the cardiovascular agents are related to the increase in the liver enzymes (28) showed by the Dormann et al. [44]. In view of above data, our drug class study maximum related to the Anti-hypertensive (35, 37.6%) followed by the Anti-hyperglycaemias (12, 12.9%), 10 each of Steroids, NSAIDs (10.7%) and others (26, 27.9%) (Figure 2).

Organ system affected

Maximum of the drugs affecting the organ system was cardiovascular system (CVS, 32.2%), followed by the Endocrine (30.1%), Neurological (8.6%), Gastrointestinal (7.5%), Dermatological (5.3%) and Mucosekeletal, Respiratory, Haematological, Ophthalmic (1 each, 1.07%) in comparison to other studies Plessen CV et al., and Fattinger et al., showed Gastrointestinal was the major affecting organ system [43,45]. Arulmani et al., showed that the most affected organ system was skin (56, 34.1%) followed by the CNS (31, 18.9%) [38] (Figure 3).

Analysis of ADR

Depending upon the WHO causality scale the highest ADR falls in the category of probable (64, 68.8%) followed by the certain (21, 22.5%), Possible (7, 7.5%) and unlikely (1, 1.0%) that is similar to the results of Arulmani et al., classified two third of the reactions as probable (102, 62.2%) [38]. Another study by Vora et al., stated that maximum of ADRs occurred as certain (28, 59.57%) [37] (Figure 4).

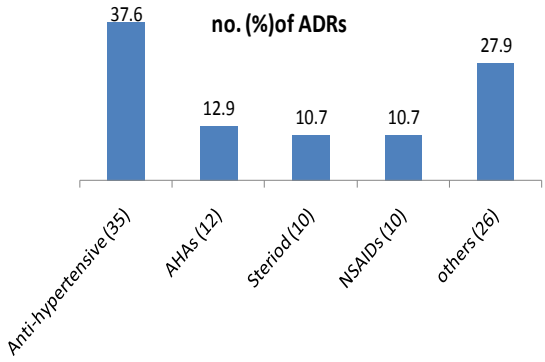

Figure 2: Drug class related ADRs.

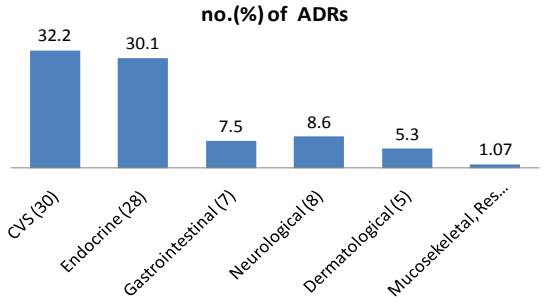

Figure 3: ADRs affecting organ system.

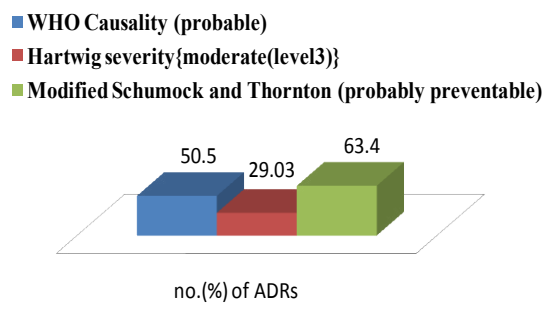

Figure 4: Analysis of ADRs depending upon the causality, severity and preventability.

A Hartwig Scale defined for calculating the severity was used, maximum of ADR come under the category of moderate level 3 (21, 22.5%) which is similar to the other study done by Sinha et al., having severity as moderate (77.12%) [40]. The other two studies by the Takata et al., and Arulmani et al., showed mild as severity having 97% and 53.7% respectively [38,41]. A broad classification in terms of severity reported as mild (35, 37.8%), moderate (65, 69.8%), severe (9, 9.67%). A major finding in the moderate severity was level 4b (20, 21.5%).

An ADR scale used for the calculation of preventability done on the basis of Modified Schumock and Thornton preventability scale which was maximized in terms of probably preventable (75, 80.6%) followed by the not preventable (13, 13.9%) and definitely preventable (5,5.37%). Davies et al. [2] stated that half of ADR was definitely preventable, in comparison Handler et al., and Wet et al., judged preventability as 42% [46,47].

Trigger tool

Naessens et al., resulted in the Anti-emetic (32%) trigger has maximum probability followed by the Diphenhydramine (10%), abrupt medication stop (8%), Transfer to higher level of care (4.9%), Over sedation / Hypotension (3.8%), Vitamin K administration (3.2%), High Serum Creatinine (2.6%), glucose less than 50 mg/dl (2.2%) [48]. In comparison ,our study relates data maximum of ADR to the cessation of drug trigger tool (37.3%) followed by the Hypotension (13.2%) and others described in the above Figure 5 as follows that is significantly comparable to other study done by the Takata et al., abrupt medication stop (19.7), PTT > 100 s (16.7), Over sedation/ lethargy/ fall/ hypotension (14.9), Diphenhydramine (8.44), Rise serum Creatinine (3.85), Laxative (2.82), Anti-emetic (1.55), glucose less than 50 mg/dl (0.6) [41] (Figure 5).

Eighty three trigger tools were identified in 40 subjects. Out of which, 63 positive trigger tools were utilized to report 80 (86.02%) ADRs and 20 (21.5%) triggers (like Diphenhydramine, Vitamin K, PTT, INR, diphenoxylate and loperamide, Clostridium difficile positive stool) resulted in no ADRs. During the study Trigger number (24) customized to individual institution was used, new trigger are developed like hypertension (4, 4.8%), Steroid (3, 3.6%) and Laxative and Enema (5, 6.0%). In view of above data and practice, according to the Trigger number (24) customized to individual institution, some of the triggers are drop out like vitamin K, Diphenhydramine, diphenoxylate and loperamide, and some of are replaced in simple terms like Clostridium difficile positive stool trigger with Loose stool trigger.

The percentage of contribution by the trigger tool in identification and reporting of suspected ADRs Medication trigger (42, 50.6%) followed by the clinical trigger (16, 19.2%) and laboratory trigger (5, 6.0%). Handler et al., stated that laboratory/ medication signal contribute 75% of preventable ADRs in comparison our study resulted 56.6% [47].

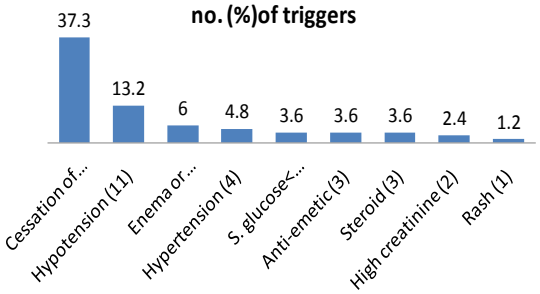

Figure 5: Trigger tool for reporting of suspected ADRs.

Limitation and future direction

Firstly, the use of trigger tool was done only in the in-patients of General medicine. Secondly, the time period for conducting the research was less to make more validated data for that study should be continued further, depending upon this situation the research is still going on to prove trigger tool is better scientific tool for identification and reporting of ADRs than the traditional reporting system. Thirdly, there are new trigger tool was adopted in the study for that validation of Trigger was needed. Fourth, there was a need of training regarding the trigger tool in the Health Care Professionals for better outcomes of patient in both the prospects health and economics. This scientific tool study was mainly done in developed countries, a developing countries like India still behind to overcome and solve the problem of ADRs, there is a need to develop the strategies like trigger tool in all the health care institution for the better patient safety.

Conclusion

This is the scientific systemic tool approach to indentifying and reporting of ADRs to overcome the traditional poor approach or we can say a add on therapy to the spontaneous reporting for the Health Care Professionals, a need of vigilant monitoring for the better patient safety that results in indentify of ADR, accounted for incidence of 18.1%. Such type of studies should be continued for the further research in pharmacovigilance program.

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References

1. Hakkarainen KM, Hedna K, Petzold M, Hägg S (2012) Percentage of patients with preventable adverse drug reactions and preventability of adverse drug reactions--a meta-analysis. PLoS One 7: e33236.
2. Davies EC, Green CF, Taylor S, Williamson PR, Mottram DR, et al. (2009) Adverse drug reactions in hospital in-patients: a prospective analysis of 3695 patient-episodes. PLoS One 4: e4439.
3. Lazarou J, Pomeranz BH, Corey PN (1998) Incidence of adverse drug reactions in hospitalized patients: a meta-analysis of prospective studies. JAMA 279: 1200-1205.
4. de Vries EN, Ramrattan MA, Smorenburg SM, Gouma DJ, Boermeester MA (2008) The incidence and nature of in-hospital adverse events: a systematic review. Qual Saf Health Care 17: 216-223.
5. Gandhi TK, Seger DL, Bates DW (2000) Identifying drug safety issues: from research to practice. Int J Qual Health Care 12: 69-76.
6. Stelfox HT, Palmisani S, Scurlock C, Orav EJ, Bates DW (2006) The "To Err is Human" report and the patient safety literature. Qual Saf Health Care 15: 174-178.
7. Einbinder JS, Scully K (2001) Using a clinical data repository to estimate the frequency and costs of adverse drug events. Proc AMIA Symp .
8. Patel KJ, Kedia MS, Bajpai D, Mehta SS, Kshirsagar NA, et al. (2007) Evaluation of the prevalence and economic burden of adverse drug reactions presenting to the medical emergency department of a tertiary referral centre: a prospective study. BMC Clin Pharmacol 7: 8.
9. Morimoto T, Gandhi TK, Seger AC, Hsieh TC, Bates DW (2004) Adverse drug events and medication errors: detection and classification methods. Qual Saf Health Care 13: 306-314.

10. Lisby M, Nielsen LP, Brock B, Mainz J (2010) How are medication errors defined? A systematic literature review of definitions and characteristics. Int J Qual Health Care 22: 507-518.

11. Adler L, Desham CR, Purinton R, MCkeever M, Guilloteau F, et al. (2008) Global trigger tool: Implementation basics. J Patient Saf 4: 245-249.

12. NCC MERP. National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP). (2001) Index for Categorizing Errors.

13. Payne TH, Savarino J, Marshall R, Hoey CT (2000) Use of a clinical event monitor to prevent and detect medication errors. Proc AMIA Symp.

14. Morimoto T, Sakuma M, Matsui K, Kuramoto N, Toshiro J, et al. (2011) Incidence of adverse drug events and medication errors in Japan: the JADE study. J Gen Intern Med 26: 148-153.

15. Thomas EJ, Petersen LA (2003) Measuring errors and adverse events in health care. J Gen Intern Med 18: 61-67.

16. Aspden P, Corrigan JM, Wolcott J, Erickson SM (2004) Patient Safety: Achieving a New Standard of Care. The National Academy Press, Washington, DC, USA.

17. Loke YK, Derry S (2001) Reporting of adverse drug reactions in randomised controlled trials - a systematic survey. BMC Clin Pharmacol 1: 3.

18. Jha N, Shankar PR, Bajracharya O, Gurung SB, Singh KK (2012) Adverse drug reaction reporting in a pharmacovigilance centre of Nepal. Australas Med J 5: 268-271.

19. Murff HJ, Patel VL, Hripcsak G, Bates DW (2003) Detecting adverse events for patient safety research: a review of current methodologies. J Biomed Inform 36: 131-143.

20. Handler SM, Altman RL, Perera S, Hanlon JT, Studenski SA, et al. (2007) A systematic review of the performance characteristics of clinical event monitor signals used to detect adverse drug events in the hospital setting. J Am Med Inform Assoc 14: 451-458.

21. Naessens JM, Campbell CR, Huddleston JM, Berg BP, Lefante JJ, et al. (2009) A comparison of hospital adverse events identified by three widely used detection methods. Int J Qual Health Care 21: 301-307.

22. The Health foundation. Evidence scan: Global trigger tool. London, UK.

23. Mull HJ, Nebeker JR (2008) Informatics tools for the development of action-oriented triggers for outpatient adverse drug events. AMIA Annu Symp Proc.

24. Snyder RA, Fields W (2010) A model for medication safety event detection. Int J Qual Health Care 22: 179-186.

25. Sharek PJ, Horbar JD, Mason W, Bisarya H, Thurm CW, et al. (2006) Adverse events in the neonatal intensive care unit: development, testing, and findings of an NICU-focused trigger tool to identify harm in North American NICUs. Pediatrics 118: 1332-1340.

26. Handler SM, Hanlon JT, Perera S, Saul MI, Fridsma DB, et al. (2008) Assessing the performance characteristics of signals used by a clinical event monitor to detect adverse drug reactions in the nursing home. AMIA Annu Symp Proc .

27. Burch KJ (2011) Using a Trigger Tool to Assess Adverse Drug Events in a Children's Rehabilitation Hospital. J Pediatr Pharmacol Ther 16: 204-209.

28. Sarkar U, López A, Maselli JH, Gonzales R (2011) Adverse drug events in U.S. adult ambulatory medical care. Health Serv Res 46: 1517-1533.

29. Miller MR, Elixhauser A, Zhan C, Meyer GS (2001) Patient Safety Indicators: using administrative data to identify potential patient safety concerns. Health Serv Res 36: 110-132.

30. Rozich JD, Haraden CR, Resar RK (2003) Adverse drug event trigger tool: a practical methodology for measuring medication related harm. Qual Saf Health Care 12: 194-200.

31. Classen DC, Metzger J (2003) Improving medication safety: the measurement conundrum and where to start. Int J Qual Health Care 15 Suppl 1: i41-47.

32. Brown S, Black K, Mrochek S, Wood A, Bess T, et al. (2000) RADARx: Recognizing, Assessing, and Documenting Adverse Rx events. Proc AMIA Symp .

33. Good VS, Saldaña M, Gilder R, Nicewander D, Kennerly DA (2011) Large-scale deployment of the Global Trigger Tool across a large hospital system: refinements for the characterisation of adverse events to support patient safety learning opportunities. BMJ Qual Saf 20: 25-30.

34. Tuttle D, Holloway R, Baird T, Sheehan B, Skelton WK (2004) Electronic reporting to improve patient safety. Qual Saf Health Care 13: 281-286.

35. Brenner S, Detz A, López A, Horton C, Sarkar U (2012) Signal and noise: applying a laboratory trigger tool to identify adverse drug events among primary care patients. BMJ Qual Saf 21: 670-675.

36. Matlow AG, Cronin CM, Flintoft V, Nijssen-Jordan C, Fleming M, et al. (2011) Description of the development and validation of the Canadian Paediatric Trigger Tool. BMJ Qual Saf 20: 416-423.

37. Vora MB, Trivedi HR, Shah BK, Tripathi CB (2011) Adverse drug reactions in inpatients of internal medicine wards at a tertiary care hospital: A prospective cohort study. J Pharmacol Pharmacother 2: 21-25.

38. Arulmani R, Rajendran SD, Suresh B (2008) Adverse drug reaction monitoring in a secondary care hospital in South India. Br J Clin Pharmacol 65: 210-216.

39. Gor AP, Desai SV (2008) Adverse Drug Reactions (ADR) in the inPatients of Medicine Department of a Rural Tertiary Care Teaching Hospital and Influence of Pharmacovigilance in Reporting ADR. Indian J Pharmacol 40: 37-40.

40. Singh H, Kumar BN, Sinha T, Dulhani N (2011) The incidence and nature of drug-related hospital admission: A 6-month observational study in a tertiary health care hospital. J Pharmacol Pharmacother 2: 17-20.

41. Takata GS, Mason W, Taketomo C, Logsdon T, Sharek PJ (2008) Development, testing, and findings of a pediatric-focused trigger tool to identify medication-related harm in US children's hospitals. Pediatrics 121: e927-935.

42. Pinney D, Pearce DJ, Feldman SR (2010) Detecting adverse events in dermatologic surgery. Dermatol Surg 36: 8-14.

43. Fattinger K, Roos M, Vergères P, Holenstein C, Kind B, et al. (2000) Epidemiology of drug exposure and adverse drug reactions in two swiss departments of internal medicine. Br J Clin Pharmacol 49: 158-167.

44. Tegeder I, Levy M, Muth-Selbach U, Oelkers R, Neumann F, et al. (1999) Retrospective analysis of the frequency and recognition of adverse drug reactions by means of automatically recorded laboratory signals. Br J Clin Pharmacol 47: 557-564.

45. von Plessen C, Kodal AM, Anhøj J (2012) Experiences with global trigger tool reviews in five Danish hospitals: an implementation study. BMJ Open 2: 1-8.

46. de Wet C, Bowie P (2009) The preliminary development and testing of a global trigger tool to detect error and patient harm in primary-care records. Postgrad Med J 85: 176-180.

47. Handler SM, Hanlon JT, Perera S, Roumani YF, Nace DA, et al. (2008) Consensus list of signals to detect potential adverse drug reactions in nursing homes. J Am Geriatr Soc 56: 808-815.

48. Naessens JM, O'Byrne TJ, Johnson MG, Vansuch MB, McGlone CM, et al. (2010) Measuring hospital adverse events: assessing inter-rater reliability and trigger performance of the Global Trigger Tool. Int J Qual Health Care 22: 266-274.