



IJCP

ISSN 0974-5319

International Journal of Community Pharmacy
Volume 3 Number 3 September-December 2010

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International Journal of Community Pharmacy
indexed in
Budapest open access initiative
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Editorial

I am happy to share with you the 9th issue of International Journal of Community Pharmacy (IJCP). International Journal of Community Pharmacy (IJCP) is now one of the online indexed journals. IJCP is now officially indexed in Budapest Open Access Initiative and Directory of Open Access Journals. Hence we are happy that our journal will be accessed and will reach globally to professionals across the world.

Further, I am happy to announce that 62 Indian Pharmaceutical congress which was held at Manipal University during 17-19 December 2010 was grand success. The focus of the 62 IPC was on Hospital Pharmacy, Clinical Pharmacy and Community Pharmacy. The congress addressed main issue such established leadership in Pharmaceutical Industry, reengineer the profession in the areas of patient safety and pharmaceutical care, pharmacoeconomics and pharmacoepidemiology.

More than ten thousand delegates attended the conference. We had guest speakers and chairman from india and advanced countries. IPC 2010 was well appreciated and acknowledged by the delegates. I take this opportunity to thank each and every one involved in the success of this mega event.

I also wish the entire fellow pharmacist a happy and successful year 2011.

Prof N Udupa

Editor In Chief, IJCP

MESSAGE FROM ACPI

Dear Members

In the new millennium the disease patterns are changing their epidemiology and thus the health care challenges . The disease like Diabetes and hypertension are on the rise. You can find the people with this condition every where. They are all illiterate as for the disease is concerned. They have meager idea about how to face the challenge. Unfortunately the health care and topics regarding usages medicines are not a part of curriculum and all though one may be well educated but ignorant about the medicines, diseases and healthy life style. This offers all health care professional including community pharmacists to educate people and update them with knowledge, which can change the practice for better outcomes.

Many people carry myths regarding role of drugs in health care, and ignore the importance of diet and exercise in management of diabetes and BP . Hence many patients all though on medication are having poor control and out come. Unless the collective efforts and planed health care provision, the good health is a mirage.

Participants at the Second Global Forum on Human Resources for Health adopted the Bangkok Outcome Statement which reiterate the principles of the Kampala Declaration and the Code as instruments for alignment and accountability at global, regional, national and local levels, and call upon all stakeholders to accelerate implementation in a comprehensive manner.

Prof Anantha Naik Nagappa

President , ACPI, Manipal.

RISK MANAGEMENT AND REDUCTION STRATEGIES: ROLE, NEED & IMPACT ON THE PHARMACEUTICAL SECTOR

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Abstract: The treatment of risk associated with technical, natural and operational glitches with respect to the pharmacy and health care profession is of prime importance in today's competitive era. Preventing and minimizing risks associated with exposure to drug therapy is important for all: physicians, patients, pharmacists, nurses, pharmaceutical industry representatives and regulatory agencies/groups. The present paper focuses on the area of risk management which lays down a solid platform for mitigation or avoidance of risk when it exceeds a specified severity and probability of harm. Risk reduction is effective at the developmental stage of a process or any event addressing good manufacturing, clinical, laboratory, marketing, and other business practices. Certain methods used are preparation are pre marketing safety database (long term controlled, diverse and dose response safety databases), detection of unanticipated interactions as an area of safety assessment policy, comparative evaluation of the prepared safety data, performing dose related toxicity studies, special segments of adverse effects studies, computer assisted analysis etc. The bigger pharma giants also adopt policies like globalization of risk management plan, pre-marketing clinical approaches or the statistical approach, pharmacovigilance, and pharmaceutical risk sharing agreements. The Council for International Organizations of Medical Sciences (CIOMS) and the International Conference on Harmonization (ICH) are applying concepts of risk management at a regulatory level to propel the global pharmaceutical industry and to keep up with the changing business model and the industry risk profile. All these aspects give us leverage and self assessed benefits in terms of drug safety, which now is the most essential segment of not only the health care policy but of the industrial offset.

Key Words: business practices, Council for International Organizations of Medical Sciences (CIOMS), risk management plan, pharma giants

Introduction:

The beginning of the 21st century brought various assets, new markets, opportunities and services to global pharmaceutical companies, but as we near the end of its first decade we confront various technical, natural, operational glitches. One of such impeding comprehension bothering pharmaceutical industry is Risk. [1]According to various management laureates Risk may be "the variability in the expected earnings of a company". Similarly an engineering definition of risk would be:

Risk = Probability of a loss or an accident / Events being performed in a given time interval. [2]

Further there are other Financial and statistical definitions of risk according to a notified department of Risk management encompassed in any corporate enterprise or a business firm. The

term identifies with not only the new technologies, globalization, hazards, liquidity, callability, simulation but also understands the success rate governing factors of an industry. Risk in itself is so well defined that many of the IT firms just credit their effective management of the Y2K bug in 1999 as a result of just financial risk management. Even the 9/11 and the Wall Street collapse recently relentlessly made it impossible to ignore the core concept of risk. Though its effective assessment portrays and signifies the aptitude of a company in adverse circumstances but still its core remains undiscovered by the companies which have focused so much on innovation in science; especially the pharmaceutical companies.

Pharmacy, Health care and Clinical terminology has always understood variety of risk and challenges which grapple delivering profitable, new solutions for better alternatives in the global marketplace of medicine. Pharmaceutical companies are staring a daunting task of proactively assessing and managing product risk from clinical development through not only post marketing phases but also assuring safety throughout the product's lifecycle. There arises a need to explore the rationale, strategies and ideas to reduce risk in a timely, cost-efficient manner while simultaneously striving to protect public safety and preserve access to treatment. Preventing and minimizing risks associated with exposure to drug therapy is important for all: physicians, patients, pharmacists, nurses, pharmaceutical industry representatives and regulatory agencies/groups.

Table 1. Showing Levels and types of Pharma related RISK [3]

| Types of Risk | Level of Risk | | | |
|-----------------|---|---|--|---|
| | Individual | Family | Community | Society |
| Health | 1. HIV/AIDS/ Hepatitis C 2. Respiratory problems through smoking any drug | Spread of infectious diseases | Health risk from used needles and syringes | Added pressure on health facilities/ services |
| Social | 1. Breakdown in social relationships 2. Social stigma | 1. Marital problems 2. Stigma on family 3. Arguments/ violence | 1. Violence 2. Prostitution | Social taboos and evil. |
| Economic | 1. Can't find a job 2. No money | 1. No money for food/clothes 2. No money for development activities | 1. Increase in begging 2. Increased theft/robbery | Unproductive members of society not able to participate in development |
| Legal | 1. Imprisonment 2. Fine 3. Criminal record | 1. Theft from family members 2. Increase poverty, no trust | Increased criminal activities like theft and robbery | Police time and resources diverted |

Due to nature of operations various risks including availability of funds for repayment of borrowings as and when they become due, fluctuation of interest rates, foreign currency exchange rates, legislative and regulatory controls, environmental and safety matters, products liabilities, underdeveloped Product Pipeline, Patent and Product Protection, Retention of key talent, Price Control, Product Launch Delays, Regulatory Approval, Product Supply, Inventory Policies, Company Restructuring , Changes in Competitive Environment, Distribution channels and Customers , Research and Development processes etc. have being the major risks confronting the Pharmacy industry.

Hence this paper here focuses on the Risk reduction and the reassessment of the risk management principles underlying the pharmaceutical sector.

While pharmaceuticals companies have their processes and controls in place to manage risk, it is now time to reassess their risk framework and to make any modifications that are needed to stay current with the evolving business model and the changing industry risk profile.

The bigger picture of Quality Risk Management involves: [4] ,[1].



Fig. 1 Quality Risk Management Process.

Risk Reduction: The Crux of Risk Management:

This area of risk management lays down a solid platform for mitigation or avoidance of risk when it exceeds a specified severity and probability of harm. The basic requirement for companies is to track and comply with a broad array of regulations addressing good manufacturing, clinical, laboratory, marketing, and other business practices. All these aspects give us leverage and self assessed benefits in terms of drug safety, which now is the most essential segment of not only the health care policy but of the industrial offset. Hence it is of the utmost importance to have a wider knowledge of these risk reduction strategies.

Table 1. Showing various risk reduction phases and its role in the pharmaceutical sector.

| PRINCIPLES OF EFFECTIVE RISK REDUCTION | IMPLEMENTATION IN THE PHARMA SECTOR |
|---|---|
| R&D Risk (Fragmenting and generating the database of risk factors, there compliance with the products demonstrated benefits)[5] | <p>Pre marketing Safety Database (Long term controlled, diverse and dose response safety databases)</p> <p>Detection of unanticipated interactions as an area of safety assessment policy.</p> <p>Comparative evaluation of the prepared safety data.</p> |
| Manufacturing Risk (Considering newer, safer and risk free product development programs) [6] | <p>Dose related toxicity studies are performed to estimate the frequent maintenance dose.</p> <p>Special segments of adverse effects studies must be performed which are not likely to be readily reported.</p> <p>Special studies for pediatrics.</p> <p>Miscellaneous assessments and reservation techniques must be followed in studies related to phase 3 clinical trials, pharmacogenomic markers, immunogenecity, clinical markers, and serious adverse events pertaining to certain genetic markers.</p> |
| Medication errors (Minimizing the risks involving proposed proprietary name, the established name, the proposed labeling and proposed packaging) [7] | <p>Computer assisted analysis must be carried out.</p> <p>Use of direct observation during clinical trials.</p> <p>Directed interviews of consumers and medical and pharmacy personnel to better understand comprehension.</p> <p>Simulated prescriptions and over the counter (OTC) studies.</p> |

Besides the above risks there are certain risk reduction policies adopted globally by pharma giants such as:

1. Globalization of risk management plan.

Risk reduction is effective at the developmental stage of a process or any event. Harmonization of the plan globally requires the firms to understand the safety of the pharmaceutical products by conducting investigational studies on the safety aspects prior to marketing. While globalization is another trend familiar to pharma, new pressures have exerted greater challenges on organizations. There has to be a complete understanding of risks globally encountered:

1. Counterfeiting
2. Data privacy
3. Intellectual property issues

The global risk reduction strategies and international harmonization lends the ability to react to changes in the market such as:

1. Individual market requirements
2. Local market competition
3. Broad scale roll out of company wide initiatives
4. Greater sense of urgency while working with 3rd party agencies.

The tactics and strategy employed in the decision making process while combating risk is an essential requirement. Further the regulatory compliance to execute a coordinated risk management plan is essential as a coordinated risk management plan that satisfies both the EU and U.S. regulatory bodies on a global scale.

Regional requirements must also be taken care of within a regulatory region various therapeutic disciplines are beginning to adopt safety requirements to assess risk. Therapeutic disciplines not only comply with the regional requirements but now there is an increasing trend of safety analysis to combat risk. Further registries and observational studies are becoming increasing important research tools in the post-approval regulatory environment. These are some of the basic core programs which are set up with minimal logistical commitments.

Pharmaceutical companies conservative nature of the current regulatory safety environment may eventually swing back to a less conservative nature as it is impossible to predict what the next public health crisis will be (perhaps the onset of pandemic flu) that convinces the public and their government representatives that it is a higher priority to expedite the development of needed medications rather than ensuring the public health by preventing the marketing approval of medications that produce serious adverse events in a fraction of the treated population. No medication is without risk, but it is still a largely qualitative opinion what constitutes risk in peoples' minds and what benefit justifies the corresponding level of risk. [8-9]

2. Pre-Marketing Clinical Approaches Or The Statistical Approach.

Considering the safety assessment of new chemical and therapeutic entities and the risks associated with drug development and regulations an evaluation procedure becomes a must and further substantiates operational risk reduction. The International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH) addresses the issue in a competent manner by not only bringing together the risk managers of the pharmaceutical industry from Europe, Japan and the United States of America but also seeking newer disciplines. These concepts would act as a catalyst in combating redundant and duplicative technical approaches among the developed countries for registering new medicinal substances and products. [10]

One such approach developed by the ICH is the introduction of guidelines or position papers regarding:

1. Drug efficacy
2. Safety of the medicine
3. Quality

Out of these three topics drug safety comes to us as a prime importance as to date, this has not received any attention by the statistical framework community. Hence with the endeavors of International Conference on Harmonization (ICH) drug safety pre clinically is evaluated by:

- 1) Pharmacodynamic approach, hence evaluating the dose-response relationship and determining the therapeutic index which would support drug registration (especially dose/toxicity balance).[11]
- 2) Population oriented approach, which means studies in support of special populations, for example geriatrics, pediatrics, female population, a particular race, or even for a population suffering for a specific disease. [12]
- 3) ICH Draft Guideline 3 on 'The extent of population exposure required assessing clinical safety for drugs intended for long-term-treatment of non-life-threatening conditions'.[13]

The ICH special population guideline concerning studies in geriatric patients is closely related to a recent Food and Drug Administration 'Guideline for the study and evaluation of gender differences in the clinical evaluation of drugs', which is another example of a 'subgroup' for whom specific interest exists to evaluate drug safety and efficacy. [12], [13], [14].

3. Pharmacovigilance.

Drug safety risk management focuses on not only pre-clinical safety data, clinical trials and adverse events but also on disciplines like post marketing or post-authorization period. The pharmaceutical sciences contemplate the emerging need of proactive consideration of risks and potential benefits of drugs in the pre- and peri-approval stages of drug development. Pharmacovigilance science has evolved in a bigger compendium owing to the recent growth of subjects like biochemistry; pharmacotherapeutics and advances in computational applications to

medicine have laid the path of development of more complex medicines previously unobtainable. [15]

The computer has also permitted a more thorough assessment of risks and potential benefits even earlier in the development process. There lies the utmost importance for the pharmaceutical innovators, regulators and healthcare professionals of developing guidelines for enhanced Pharmacovigilance due to the concern regarding the complexity of more sophisticated medicines, in combination with new sciences. [16]

CIOMS and ICH Initiatives in Pharmacovigilance:

The Council for International Organizations of Medical Sciences (CIOMS) and the International Conference on Harmonization (ICH) are applying concepts of risk management to medicines throughout their life cycle, from preclinical and clinical development to marketed use. The CIOMS VI Working Group recommends a developmental pharmacovigilance concept, according to which a drug development supporting the science and ethics of research leading up to licensing (marketing authorization) and continuing to post-authorization (post marketing) Pharmacovigilance is carried out. [17] According to this group the pharmaceutical industry is as much as 50 percent riskier than the rest of the S&P 500 and their risk management infrastructure lacks the depth and the metal to keep up with the changing business model and the industry risk profile.

With respect to this ICH also initiates 'Pharmacovigilance Planning' which attributes mainly four concepts in pharmacovigilance management of medicinal products. [18]

1. The 'Pharmacovigilance Specification' which contains brief aspects and spectrum of the medicine in question. In terms of management science it includes:
 - I. Safety risks (At the licensing stage)
 - II. Potential risks (In terms of marketing management)
 - III. Miscellaneous risks relating to any missed or unknown information risk.
2. The 'Pharmacovigilance Plan' identifies a common understanding and intellect between regulating factors and the pharmaceutical industry is a prime factor in illustrating vigilant plans during the post marketing surveillance stage.
3. The 'Pharmacovigilance practice' involves direct dealing with health professionals and patients to ensure the transparency of regulatory aspects. This practice is mainly seen at the marketing level as marketing authorization or licensing aspect is less significant.
4. The 'Epidemiological approach' is planned when issues and challenges exist or the data in question is limited.

The kind of pharmacological entities present in the market including medicines like new drugs, biological agents, orphan drugs and major extensions to existing medicines involve proactive pharmacovigilance in compliance with CIOMS and ICH initiatives. These concepts are very much like the emerging risk-management strategies in the US, the European Union and Japan. [19]

4. Pharmaceutical risk sharing agreements

The modern health care policy works on increased spending on pharmaceuticals and the increasing costs of bringing products to the market, as well as increased utilization of pharmaceuticals. All these factors lead to increased pharmaceutical expenditure, increasing the economic and financial risk. Further inappropriate use of pharmaceutical products also increases healthcare costs. The advent of high drug prices puts pressure on pharmaceutical companies to build confidence in the proposition that their products are worth the additional expense. To overcome this, to increase the confidence level and maintaining investment incentives a competent approach for the pharmaceutical company is to share the risk of a situation in which there is uncertainty about whether the product is effective for the consumer and payer. Such risk-sharing arrangements for pharmaceuticals, like warranties, can be used to signal high quality when product quality is not fully observable. Such risk-sharing plans may become a staple feature of the market in the future. [20]

Conclusions:

The growth of a pharmaceutical industry is very much dependent on the risk factor and how a company should have a methodology for identifying and evaluating the risks it faces. There should be a process for generating intervention plans to reduce the risks to an acceptable level. Risk reduction is a key aspect of effective risk management. The global risk reduction strategies and international harmonization lends the ability to react to changes in the market. Pharmaceutical companies enjoy benefits like:

1. Better-informed decisions
2. Greater management consensus
3. Increased management accountability
4. Smoother governance practices
5. Ability to meet strategic goals
6. Better communication to board
7. Reduced earnings volatility
8. Increased profitability
9. Use of risk as a competitive tool
10. Accurate risk-adjusted pricing

But to enjoy these benefits Pharmaceutical companies conservative nature of the current regulatory safety environment may eventually swing back to a less conservative nature.

Hence Pharmaceutical companies are staring a daunting task of proactively assessing and managing product risk from clinical development through not only post marketing phases but also assuring safety throughout the product's lifecycle.

References:

1. Ghosh, S. Risk Reporting: An Essence of Risk Management. *The Management Accountant* 2009; 44(02): 99-106.
2. Gangadhar, V. and Reddy, G.N. Measurement and Management of Risk. *The Management Accountant* 2009; 44(02): 94-98.

3. Safi, N. and Zafar, M. Harm Reduction Strategy for IDU (Injecting Drug Use) and HIV/AIDS Prevention in Afghanistan. Ministry of Public Health. http://www.ahrn.net/library_upload/uploadfile/file2495.pdf , accessed on 1 July 2010.
4. ICH Q9 Quality Risk Management, US department of Health and Human Services. Food and Drug Administration, CDER & CBER. June 2006.
5. Annex 1 ICH Q8 Quality Risk Management, US department of Health and Human Services. Food and Drug Administration, CDER & CBER. 2003
6. EIA, The Extent of Population Exposure to Assess Clinical Safety: For Drugs Intended for Long- term Treatment of Non Life Threatening Conditions, ICH. 2005.
7. Summerfield, P. and Shoemaker, D. (2008) Global Risk Management The changing safety landscape in the EU and US. <http://www.contractpharma.com/articles/2008/09/global-risk-management> accessed on 31 June 2010.
8. Hudson, R. The costs of globalization: Producing new forms of risk to health and well-being. *Risk Management* 2009;11(1):13–29.
9. Kairuz, TE., Gargiulo, D., Bunt, C. and Garg, S. Quality, safety and efficacy in the 'off-label' use of medicines. *Paediatric Drugs* 2002;4(6):353-359.
10. Benjamin, DM. Reducing medication errors and increasing patient safety: case studies in clinical pharmacology. *PMID: 12856392 [PubMed - indexed for MEDLINE]: J Womens Health (Larchmt)* 2005;14(1):61-67.
11. Hartford, C.G., Petchel, K.S., Mickail, H., Perez,G.S., McHale, M.,Grana, J.M. and Marquez, P. Pharmacovigilance during the pre-approval phases: an evolving pharmaceutical industry model in response to ICH E2E, CIOMS VI, FDA and EMEA/CHMP risk-management guidelines. *Drug Safety* 1999;20(2):95-107.
12. O'Neill, R.T. Statistical concepts in the planning and evaluation of drug safety from clinical trials in drug development: issues of international harmonization. *Pharmacoeconomics* 2008;26(7):551-556.
13. Grissinger, M.C. and Kelly, K. Reducing the risk of medication errors in women. *PDA J Pharm Sci Technol* 2008;62(1):1-21
14. Garbus, S. (2010) Risk Management throughout a Drug Lifecycle, From Development through Post marketing: Safety Assessment, Signal Generation and Risk Mitigation. <http://bioforum.org.il/Course.aspx?cid=672> accessed on 7 July 2010.
15. Cobert, B. and Silvey, J. The Internet and drug safety: what are the implications for pharmacovigilance? *Stat Med* 1995;14(9-10):117-127.
16. Tsintis, P. and La Mache E. CIOMS and ICH initiatives in pharmacovigilance and risk management: overview and implications. *Drug Safety* 2004;27(8):130-139.
17. Edwards, B. Managing the interface with marketing to improve delivery of pharmacovigilance within the pharmaceutical industry. *Drug Safety* 2005; 28(1):1-18.
18. Bush, J.K., Dai, W.S., Dieck, G.S., Hostelley, L.S. And Hassall, T. The art and science of risk management: a US research-based industry perspective. *Drug Safety* 2004; 27(8):509-17.
19. Cook, J.P., Vernon, J.A. and Manning, R. Pharmaceutical risk-sharing agreements. *Current Drug Safety* 2007; 2(2):135-139.
20. Premarketing Risk Assessment, US department of Health and Human Services. Food and Drug Administration, CDER & CBER. Clinical Medical. March 2005.

DRUG UTILIZATION OF NON-STEROIDAL ANTI-INFLAMMATORY DRUGS AT COMMUNITY PHARMACIES IN SOUTH INDIA

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Abstract

Objective: The choice of right Non-steroidal anti-inflammatory drugs (NSAID) for a clinical condition is still controversial. We are trying to figure out the current prescribing pattern of NSAIDs in a South Indian town. The adherence of the NSAIDs and co-prescribing of gastro-protective agents to the national standards and rationality are to be evaluated. **Methods:** Prescriptions filled from the community pharmacies of Kasaragod town were evaluated for prescribing pattern based on pain, national essential drug list of India and drug utilization 90% (DU90%) of NSAIDs. The patients were also asked to score pain using Mosby pain scale. **Results:** Out of 482 prescriptions analyzed, 18 NSAID molecules were prescribed. Most prescribed NSAID include diclofenac 24%, followed by NSAID-acetaminophen (paracetamol) combinations 15%, aceclofenac 14% etc. DU90% is shared by nine NSAIDs. And 67% of the risk group was prescribed for gastro-protective agents along with NSAIDs. Most of the NSAIDs (85%) are prescribed as monotherapy and ns-NSAIDs (92%) regained the huge market of NSAIDs from coxibs. **Conclusion:** Even though the market of NSAIDs are highly fragmented, and faced controversial influence of coxibs, there are some rational prescribing patterns practiced by the prescribers in Kasaragod town, south India. The key area to be improved is to adhere more to the national essential drug list of India on prescribing NSAIDs.

Keywords: ns-NSAIDs, coxib, diclofenac, prescription

Introduction

Non-steroidal anti-inflammatory drugs (NSAIDs) are one of the most widely prescribed drugs around the world. In the past NSAIDs were used by the 20% or more of the population.¹

In the last ten years a fashionably new class of NSAIDs has come into market with a claim on overall reduction in the adverse drug reactions caused by the traditional non-selective NSAIDs(ns NSAIDs). The new drugs preferentially inhibit cyclo-oxygenase - II (COX-II) enzymes as compared to COX-I molecules, and therefore have been called as "Cox-II selective inhibitors" or "coxibs" for short. Not so late the coxibs were proved not to be cost effective and showed some serious adverse drug reactions than the traditional NSAIDs in the market. These conclusions and some evidences of seeding trials marked the way out of selective NSAIDs out of the market one by one.²

The early boost in the market for coxib molecules were reflected around the world. A Canadian study in 2004 shows Coxibs were prescribed at 56% of visits. In this study cohort, evenly divided between rofecoxib and celecoxib. Diclofenac, meloxicam, naproxen, and ibuprofen were

less commonly recommended. And only forty patients (0.7%) received aspirin prescriptions at the study visit.³

In outpatient departments of teaching hospitals in Dhaka, Bangladesh, the commonest clinical indications for prescribing NSAIDs in the medical and surgical outpatient departments were backache and traumatic injury.⁴

Out of 800 prescriptions screened in an out patient orthopedic department of a tertiary care hospital in North India, 500 patients received NSAIDs (315 males and 185 females). In 2005, rofecoxib (which was later removed from the market) was the most commonly prescribed NSAID (30.4%) followed by diclofenac, valedcoxib, ibuprofen- acetaminophen, nimesulide, celecoxib, ibuprofen, piroxicam and indomethacin. There were no significant differences between males and females for the analgesics prescription. Coxibs accounted for majority of prescriptions for elderly and diclofenac was more frequently prescribed for young patients.⁵

Co-prescribing of proton pump inhibitors (PPIs) with non-selective NSAIDs (ns-NSAIDs) is recommended in patients at risk of gastrointestinal (GI) events.⁶

An Irish study from 1999 to 2001, suggests that prescribers used COX-II inhibitors preferentially in those patients judged to be at higher risk of GI toxicity from NSAIDs. Physicians still co-prescribed anti-peptic ulcer drugs more often with these agents, compared with the ns-NSAIDs, even after age and polypharmacy were taken into account in the analysis. This suggests that prescribers still had concerns about the gastro-protective efficacy of COX-2 selective NSAIDs. This is in fact increasing the cost of treatment with no added advantage in practice.⁷

In a U.K. study, diclofenac and ibuprofen remain the most frequently prescribed NSAIDs, but a quarter of patients with long term musculoskeletal conditions were prescribed Cox II selective drugs in 2003. While most patients taking Cox II selective drugs had at least one 'The National Institute for Clinical Excellence' (NICE) risk factor for gastrointestinal adverse reactions, two-thirds of patients taking long-term NSAIDs also had at least one NICE risk factor for gastrointestinal adverse reactions.⁸

Methods

We have one survey using a structured questionnaire for evaluating the prescription pattern of NSAIDs. Information from the prescription filled from the selected pharmacies was evaluated for prescription pattern based on NSAID of choice in different gender, type and extent of pain. Co-prescription of gastro-protective agents was also evaluated. Drug utilization 90% (DU90%) of the NSAIDs was also calculated. Rationality of prescribing NSAIDs as monotherapy and adherence to the national essential drug list of India were also checked.

Area of study

The Prescriptions filled from the community pharmacies in Kasaragod town, South India were selected for the study. Five major community pharmacies of different locations were selected to get a picture of prescription pattern in the town. Patients from the tertiary care, secondary care

hospitals and primary health centers were visiting the pharmacies under study. Also there were prescriptions from independent consultants who work part time for some hospital facility in the town.

Survey procedure

Prescriptions containing NSAIDs were evaluated for the prescribing pattern. Polypharmacy prescriptions containing more than three drugs were excluded from the study. Prescriptions for different gender and risk group of developing gastrointestinal adverse drug reactions were categorized into different groups. Prescriptions using NSAIDs such as acetyl salicylic acid tab 300-350mg, diclofenac tab 50, 100mg, diclofenac inj. 25 mg/ml, ibuprofen tab 200, 400 mg etc from the national essential drug list (EDL) of India were noted.

Patients were asked to fill 'The Mosby Pain Scale' which is a scale from zero to ten describing least to the worst pain.

Data analysis

Data were analyzed by simple percentage calculations and distribution of relevant information to separate classes like how many patients were prescribed with a particular NSAID and what was the pain intensity of the patient etc. SPSS software (version 12.0) was used for the tabulation of results. The Mosby Pain Scale is used to measure the pain level of the patients. Choices of NSAID were compared based on pain intensity and types of pain. DU90% for all NSAIDs was also calculated. DU90% includes those drugs accounting for 90% of prescriptions within the group of medicines being studied.⁹

Period of survey

The study was conducted from May - October 2009. Five different pharmacies were visited by us in the evenings of the working days and few hours in some holidays.

Results

In the 482 prescriptions analyzed, 18 NSAID molecules were prescribed. Most prescribed NSAID is diclofenac (n 117), followed by NSAID-acetaminophen combinations (n 71), aceclofenac (n 68), mefenamic acid (n 47), nimesulide (n 41), etoricoxib (n 32), ibuprofen (n 29), indomethacin (n 18), piroxicam (n 13), aspirin (n 11), naproxen (n 09) lornoxicam (n 09), and few more rare ones. Most of the NSAIDs were prescribed as monotherapy. Only 14.7% of NSAIDs were prescribed in combination with paracetamol and 6.6% with serratiopeptidase.

Diclofenac is the leading drug in joint pain including arthritis and gout (n 27), generalized pain (n 20) and muscular pain (n 16). NSAID-acetaminophen combinations are the leading drugs in treatment of dental pain (n 22). Drugs of choice for higher pain level (i.e. 7 or above) are diclofenac (n 24), aceclofenac (n 22), mefenamic acid (n 15), nimesulide (n 14), etoricoxib (n 13), NSAID-paracetamol combinations (n 09) etc.

Drug utilization 90% include nine preparations with a total of 90.5% (n 436) prescriptions including; diclofenac (117), NSAID-acetaminophen combinations (71), aceclofenac (68), mefenamic acid (47), nimesulide (41), etoricoxib (32), ibuprofen (29), indomethacin (18), piroxicam (13)

Women were prescribed with 31% of NSAIDs from national EDL of India and men were prescribed with 38%.

For the risk groups having previous gastrointestinal adverse drug reactions, different proton pump inhibitors were prescribed for the tune of 38%, H-2 blockers mainly ranitidine and famotidine 25% and others including domperidone or antacids for 4% were also prescribed. The non-risk group was prescribed with 10% proton pump inhibitors, 11% H-2 blockers and 3% domperidone and antacids.

Discussion

Community pharmacies under study receive prescriptions containing NSAIDs from out patient departments of different hospitals and also from independent consultants. There are less common regulations or policies on prescribing. The prescribers adhere less to the national EDL of India.

After the short life of 'coxib' NSAIDs (only 8% is prescribed now), Diclofenac and Aceclofenac are the most prescribed individual drugs and drug of choice for different types of pain as well as higher pain intensity. NSAID-acetaminophen combinations such as diclofenac-acetaminophen, aceclofenac-acetaminophen, ibuprofen-acetaminophen etc are also widely used. Last members of the withdrawing 'coxib' molecules now being prescribed are Celecoxib and Etoricoxib. NSAIDs show comparable efficacy in general, but they vary more on the safety profiles. Especially the coxib molecules are having more safety problems than the ns-NSAIDs. Even different coxibs having variations in their safety profiles may be explained based on their differences in pharmacokinetics.

The risk groups of developing gastrointestinal adverse drug reactions have been prescribed more often with gastro-protective drugs along with NSAIDs. The non-risk group was mainly without any gastro-protective agents with NSAIDs. While, 67% of the risk group was prescribed for gastro-protective agents with NSAIDs, 76% of the non-risk group was not prescribed for any gastro-protective agents with NSAIDs.

Nine NSAID preparations are sharing the DU 90% group. Also we have seen that there are fewer adherences to the national essential drug list of India. There were no significant gender variations seen in prescription pattern of NSAIDs for men and women. There are again no remarkable variation in the gastro-protective agents used among men and women.

Conclusion

The prescribing pattern of the doctors in outpatient departments of tertiary care hospitals and private consultants in Kasaragod is highly fragmented. Prescribing pattern from the national EDL of India is poor. DU 90% is shared by nine NSAIDs. But positively around 85% of the

NSAIDs are prescribed as monotherapy. And 92% of the ns-NSAIDs are prescribed after the convincing evidences of poor risk benefit ratio of coxibs. Diclofenac and aceclofenac as monotherapy or in combination with acetaminophen constitute around half of the whole NSAID prescriptions. Most of the patients in the risk group of developing gastrointestinal adverse drug reactions received the gastro-protective agents mainly the proton pump inhibitors. So we can conclude that there are some rational prescribing patterns for the prescribers. But an essential area of improvement could be to adhere more to the national EDL of India.

Acknowledgement

We acknowledge all the community pharmacies co-operated with us in the study. Also we are thankful for the methodological guidance by the research wing of Karpagam University, Coimbatore, South India in timely completion of the work.

References

1. Pincus T, Swearingen C, Cummine P and Callahaw LP. Preference for non-steroidal anti-inflammatory drugs versus acetaminophen and concomitant use of both types of drugs in patients with osteoarthritis. *J Rheumatol.* 2000; 27:1020-7.
2. Doupe Malcolm, Katz Alan and Kvern Brent. Encouraging physician appropriate prescribing of non-steroidal anti-inflammatory therapies: protocol of a randomized controlled trial [ISRCTN43532635]. *BMC Health Services Research.* 2004; 4:21-30.
3. Sebaldt Rolf J., Petrie Annie, Goldsmith Charles H. and Marentette Michael A. Appropriateness of NSAID and Coxib prescribing for patients with osteoarthritis by primary care physicians in ontario: results from the CANOAR Study. *Am J Manag Care.* 2004; 10:742-750.
4. Rahman Md. Shamsur, Begum Zinnat Ara and Samad Md. Khoshroz. Prescribing pattern of non-steroidal anti-inflammatory drugs at outpatient departments of teaching hospitals. *Bangladesh J Pharmacol.* 2007; 2:1-6.
5. Gupta M, Malhotra S, Jain S, Agarwal A and Pandhi P. Pattern of prescription of non-steroidal anti-inflammatory drugs in orthopaedic outpatient clinic of a North Indian tertiary care hospital. *Indian Journal of Pharmacology.* 2005; 37:404-405.
6. Suh D.-C, Hunsche E., Shin H.-C. And Mavros P. Co-prescribing of proton pump inhibitors among chronic users of NSAIDs in the UK, *Rheumatology.* 2008; 47:458–463.
7. Teeling Mary, Bennett Kathleen and Feely John. Have COX-2 inhibitors influenced the co-prescription of anti-ulcer drugs with NSAIDs. *Br J Clin Pharmacol.* 2003; 57: 337–343.
8. Thompson P. W., Tee L., McBride J., Quincey D. And Liddiard Strat G. Long-term NSAID use in primary care: changes over a decade and NICE risk factors for gastrointestinal adverse events. *Rheumatology.* 2005; 44:1308–1310.
9. Barozzi Nadia and Tett Susan E. Non-steroidal anti-inflammatory drugs, Cyclooxygenase-2 inhibitors and paracetamol use in Queensland and in the whole of Australia. *BMC Health Services Research.* 2008; 8:196-205.

DABIGATRAN: WILL WARFARIN BECOME A DRUG OF THE PAST

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Abstract : Until 1990s VTE was considered as a complication of hospitalization for major surgery. However further clinical trials identified some of the predisposing factors for VTE like prolonged immobilization, increasing age, obesity, pregnancy, use of oral contraceptives, presence of central venous lines, inherited and acquired hematological conditions like antithrombin deficiency, protein C and protein S deficiency, elevated levels of coagulation factors, concomitant medical illnesses such as cancer, acute myocardial infarction, and respiratory failure. the vitamin K antagonist warfarin oral blood thinner remains the most commonly prescribed anticoagulant for the treatment and prevention of thromboembolic events. As the only oral anticoagulation option available, warfarin use is widespread. However, concerns of safety with respect to the narrow therapeutic window and genetics which result in variations in response require regular monitoring of international normalized ratios (INRs) every 3 to 4 weeks to maintain the target range 2-3 for most of the indications. Dabigatran is a new oral anticoagulant which provides safe, effective, easy way of administration, with no routine monitoring of coagulation, any significant drug interaction, and predictable pharmacodynamic and consistent anticoagulation. Dabigatran etexilate treatment should be started within 1–4 hours of surgery with a half dose of 110 mg. Thereafter, treatment is continued with a standard dose of 220 mg once daily for 10 days after knee replacement and for 28–35 days after hip replacement. The summary of product characteristics (SPC) states that for special patient populations (including people with moderate renal impairment, those over 75 years and people receiving amiodarone), a reduced dose of 150 mg (75 mg starting dose, 150 mg continuing dose) once daily is recommended. Randomized evaluation of long term anticoagulation therapy), reports that dabigatran etexilate results are promising compared to warfarin in patients with atrial fibrillation. This novel direct thrombin inhibitor could represent a very important advance in the prevention of stroke in patients with AF and is a user friendly drug for both health care professionals and patients.

Therapeutic indication: Primary prevention of venous thromboembolic events in adult patients who have undergone elective total hip replacement surgery or total knee replacement surgery¹

Background: Venous thromboembolism (VTE), including deep vein thrombosis (DVT) and pulmonary embolism (PE), poses a public health threat and is also one of the most prevalent medical problem today. It entails a significant medical and financial burden in hospitalized patients². Venous thromboembolism is the third most common cause of cardiovascular death after myocardial infarction and stroke³

Venous thromboembolism is a condition which includes two related conditions; deep vein thrombosis (DVT) and pulmonary embolism (PE). The condition results from the formation of blood clots that block the flow of blood in the veins, most frequently occurring in the legs (DVT). Clots will break loose and become dislodged from affected veins can migrate and obstruct the blood vessels that supply the lungs (PE). Until 1990s VTE was considered as a

complication of hospitalization for major surgery. However further clinical trials identified some of the predisposing factors for VTE like prolonged immobilization, increasing age, obesity, pregnancy, use of oral contraceptives, presence of central venous lines, inherited and acquired hematological conditions like antithrombin deficiency, protein C and protein S deficiency, elevated levels of coagulation factors, concomitant medical illnesses such as cancer, acute myocardial infarction, and respiratory failure^{4,5}.

Although the risk of deep vein thrombosis cannot be entirely eliminated, it can be reduced in several ways. An effective way is to start primary prophylaxis with anticoagulant drug such as warfarin, heparin or fondaparinux in patients who are at high risk of developing DVT.

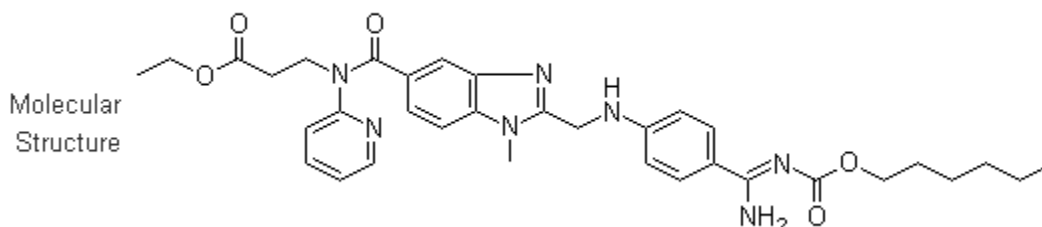
Discovered in 1950, the vitamin K antagonist warfarin oral blood thinner remains the most commonly prescribed anticoagulant for the treatment and prevention of thromboembolic events. As the only oral anticoagulation option available, warfarin use is widespread. However, concerns of safety with respect to the narrow therapeutic window and genetics which result in variations in response require regular monitoring of international normalized ratios (INRs) every 3 to 4 weeks to maintain the target range 2-3 for most of the indications. Patient counseling before hospital discharge, with focus on drug interactions, avoidance of self medications (Self management with OTC medications like Ibuprofen, Aspirin, naproxen), alternative systems of medicine, dietary considerations regarding intake of vitamin K rich food, intake of alcohol and bleeding precautions are essential. The delay in onset, prolongation of effect and high bleeding risk make it must for a patient to have frequent hospital visit and blood sampling to determine an ideal dosage. To lessen some of this initial risk, FDA has started to include pharmacogenetic testing in the prescribing information.

Dabigatran is a new oral anticoagulant which provides safe, effective, easy way of administration, with no routine monitoring of coagulation, no significant drug interaction, predictable pharmacodynamic and consistent anticoagulation⁹.

Dabigatran etexilate is a synthetic nonpeptide. The prodrug dabigatran etexilate is converted to dabigatran, a direct thrombin inhibitor, in the body. Thrombin is a key enzyme in the process responsible for clot formation by enabling the conversion of fibrinogen to fibrin during the coagulation cascade. Approximately 80% of an intravenous dose excreted unchanged in the urine¹⁰.

IUPAC¹¹: ethyl 3-[[2-[[4-[(E)-N'-hexoxycarbonylcarbamiimidoyl]anilino]methyl]-1-methylbenzimidazole-5-carbonyl]-pyridin-2-ylamino]propanoate

MW: 627.733240 g/mol | **MF:** C₃₄H₄₁N₇O₅



<http://www.chemblink.com/products/211915-06-9.htm>

Dosage and administration

Dabigatran etexilate treatment should be started within 1–4 hours of surgery with a half dose of 110 mg. Thereafter, treatment is continued with a standard dose of 220 mg once daily for 10 days after knee replacement and for 28–35 days after hip replacement. The summary of product characteristics (SPC) states that for special patient populations (including people with moderate renal impairment, those over 75 years and people receiving amiodarone), a reduced dose of 150 mg (75 mg starting dose, 150 mg continuing dose) once daily is recommended¹⁰.

Adverse effects

The major event is bleeding. Other adverse drug reactions reported are gastrointestinal hemorrhage, wound secretion, anemia and hematoma¹²

Drug Interactions:

Dosing should be reduced to 150 mg daily in patients who receive amiodarone or verapamil. In patients with moderate renal impairment and concomitantly treated with dabigatran etexilate and verapamil, a dose reduction of dabigatran to 75 mg daily should be considered. Concomitant use of other parenteral and oral anticoagulants, GPIIb/IIIa receptor antagonists, clopidogrel, sulfapyrazone and vitamin K antagonists are not recommended¹⁰. Dabigatran etexilate and dabigatran are not metabolised by the cytochrome P450 system and have no *in vitro* effects on human cytochrome P450 enzymes. Therefore, related medicinal product interactions are not expected¹. It is advised to monitor patients receiving dabigatran with nonsteroidal antiinflammatory drugs closely for signs of bleeding even though clinical trials in total knee replacement and hip replacement surgery demonstrates safe concomitant use of NSAIDs and Dabigatran¹³.

Additional Perspective:

Independent German drug major Boehringer Ingelheim says that the US Food and Drug Administration has approved a priority review designation for its novel oral direct thrombin inhibitor dabigatran etexilate for the prevention of thromboembolism in atrial fibrillation (AF) patients. An FDA advisory committee is proposed to meet on September 20 to review dabigatran etexilate data which might result in a paradigm change in antithrombotic management of atrial fibrillation. In addition to the USA, the registration process for dabigatran etexilate is in progress in Europe, Japan and other countries. The company expects to receive marketing authorization for the drug in first countries by end of 2010 or beginning of 2011. Dr Jonas Oldgren, Associate Professor of Cardiology, Uppsala Clinical Research Center, Sweden (which was one of the coordinating centers in RE-LY- Randomised evaluation of long term anticoagulation therapy), reports that dabigatran etexilate results are promising compared to warfarin in patients with atrial fibrillation. This novel direct thrombin inhibitor could represent a very important advance in the prevention of stroke in patients with AF and is a user friendly drug for both health care professionals and patients¹⁸.

Conclusion

Dabigatran is a novel direct thrombin inhibitor with rapid onset of action, very few drug-drug interaction and do not require regular monitoring. The available evidence supports the superiority of dabigatran over enoxaparin and warfarin in terms of efficacy. However more head to head randomized long term comparisons are awaited to establish its safety and efficacy profile.

Clinical efficacy

| Si no | Author/ study | Intervention | Patient groups | Duration of prophylaxis | Outcome measures | Result |
|-------|-------------------------------------|--|--|-------------------------|---|---|
| 1 | Sorrel E etal ¹⁴ | Dabigatran etexilate (220 mg once daily) was compared with enoxaparin (40 mg once daily) | TKR THR | 6-10 days 28-35 days | recurrent VTE, postthrombotic syndrome, and consequences of intracranial hemorrhage | Dabigatran etexilate was cost-saving compared with enoxaparin 40 mg once daily, with comparable efficacy and safety profiles |
| 2 | Bengt I Eriksson etal ¹⁵ | Dabigatran etexilate (220mg or 150mg once daily) was compared with enoxaparin (40 mg once daily) | THR | 33 days(mean) | total venous thromboembolism (venographic or symptomatic) and death | Both doses of dabigatran were noninferior to enoxaparin Oral dabigatran etexilate was as effective as enoxaparin in reducing the risk of venous thromboembolism, with a similar safety profile |
| 3 | Jeffrey S etal ¹⁶ | oral dabigatran etexilate 220 or 150 mg once daily, or enoxaparin 30 mg SC BID after surgery, | TKR | 12-15 days | Venous thromboembolism | 220 and 110 mg showed inferior efficacy to enoxaparin |
| 4 | RECOVER study ¹⁷ | dabigatran 150 mg twice daily or warfarin once daily | acute symptomatic venous thromboembolism | 6 months | Venous thromboembolism/fatal pulmonary embolism | Noninferiority of dabigatran over warfarin |

TKR; Total knee replacement, THR; Total hip replacement

References:

1. <http://www.medicines.org.uk/EMC/medicine/20760/SPC/Pradaxa+110+mg+hard+capsules/>

2. Abir O. Kanaan, Matthew A. Silva, Jennifer L. Donovan, Tara Roy, A. Samer Al-Homsi, Meta-Analysis of Venous Thromboembolism Prophylaxis in Medically Ill Patients. *Clinical Therapeutics*. 2007 :29.
3. Schulman S, Clive Kearon, Ajay K kakkar, Patric Mismetti, Sebastian Schellong, David Baanstra et al. Dabigatran versus Warfarin in the Treatment of Acute Venous Thromboembolism. *New England Journal of Medicine*. 2009; 361.
4. Martin G. Keane, Edward P. Ingenito, Samuel Z. Goldhaber, Utilization of Venous Thromboembolism Prophylaxis in the Medical Intensive Care Unit. *Chest* 1994;106;13-14
5. Frederick A. Anderson, Frederick A. Spencer Risk Factors for Venous Thromboembolism, *Circulation* 2003;107:I-9
6. Kaushal Patel, Craig F Feied, Deep Venous Thrombosis, eMedicine Specialties. <http://emedicine.medscape.com> Jan 2009
7. Brooke E. Baetz, Sarah A. Spinler, Dabigatran Etxilate: An Oral Direct Thrombin Inhibitor for Prophylaxis and Treatment of Thromboembolic Diseases *Pharmacotherapy*. 2008;28(11):1354-1373
8. Mary Ann E. Zagaria, Future Technology for Warfarin Dosing, *Advances in Pharmacogenetics*, *US Pharm*. 2007;32(3):34-38
9. Catherine J. Lee, Gauri Badhwar, Jack E. Ansell, Oral Ila Inhibitor. August 2010. Vol 24:4 Pg 739-753
10. National Institute for Health and Clinical Excellence (NICE); 2008 Sep. 26 p. (Technology appraisal guidance; no. 157.
11. Drug information portal: <http://druginfo.nlm.nih.gov/drugportal/ProxyServlet?>
12. <http://www.hc-sc.gc.ca/dhp-mps>
13. Eriksson B.I, Kurth A.A., Friedman R.J., Schnee J.M., Clemens A., Noack H et al Risk of bleeding with dabigatran etexilate in patients undergoing major orthopaedic surgery is not increased by concomitant use of non-steroidal anti-inflammatory drugs or acetylsalicylic acid, *Journal of hemostasis and thrombosis*, abstract from XXII ISTH congress, July 2009. vol 7 supplement 2.
- 14 Sorrel E. Wolowacz, Neil S. Roskell, Fiona Maciver, Stephen M. Beard et al. Economic Evaluation of Dabigatran Etxilate for the Prevention of Venous Thromboembolism After Total Knee and Hip Replacement Surgery, *Clinical Therapeutics*. 2009 Vol 31.
- 15 Bengt I Eriksson, Ola E Dahl, Nadia Rosencher, Andreas A Kurth, C Niek van Dijk, Simon P Frostick et al. Dabigatran etexilate versus enoxaparin for prevention of venous thromboembolism after total hip replacement: a randomised, double-blind, non-inferiority trial, *The Lancet*. Sep 2007, Pages 949-956
- 16 Jeffrey S. Ginsberg, Bruce L. Davidson, Philip C. Comp, Charles W. Francis, Richard J. Friedman, Michael H. Huo et al. Oral Thrombin Inhibitor Dabigatran Etxilate vs North American Enoxaparin Regimen for Prevention of Venous Thromboembolism After Knee Arthroplasty Surgery, *The Journal of Arthroplasty*. Jan 2009 Vol 24 Pg 1-9
- 17 Zosia Chustecka. Dabigatran Can Replace Warfarin in Venous Thromboembolism RECOVER Results, Medscape Medical News, December 7, 2009
- 18 <http://www.thepharmaletter.com> Accessed on 3rd september

TO ASSESS THE FEASIBILITY FACTORS FOR THE LAUNCH AND IMPLEMENTATION OF HOSPITAL INFORMATION SYSTEM IN MAHARASHTRA AND KARNATAKA

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Introduction:

A Hospital Information System (HIS) can be defined as a computerized system that is designed to meet all the information needs within a hospital. This includes diverse data types such as patient information, billing, finance and accounting, staffing and scheduling, pharmacy ordering, prescription handling, supplies, inventory, maintenance and orders management, diagnostic reports related to laboratory, radiology and patient monitoring as well as providing decision support.

The global hospital information systems market will climb past \$35 billion by 2015, according to a forecast by Global Industry Analysts. The Asia-Pacific region (excluding Japan) represents the fastest growing hospital information systems market, exhibiting a compounded annual growth rate of 11.5 percent over the next few years.

There are an estimated 14,000 hospitals in India, excluding the private clinics and nursing homes. This factor should be enough to drive the hospital information systems (HIS) market in India along with the corporatization of the healthcare provider space and growth in the health insurance market.

Factors Driving the HIS Market :

Health informatics initiatives by governments: An increased use of IT in the healthcare sector is being promoted by the governments of various countries in Asia-Pacific. The commitment shown by these governments to improve healthcare delivery through the implementation of information and communication technology is evident from the ambitious projects that have been planned in the past few years. In South Korea, over 90 per cent of hospitals are private. This figure is around 80 per cent in Japan. The presence of private participants in healthcare delivery acts as a major driver for the health informatics market. This is reflected in the healthcare IT infrastructure in South Korea and Japan when compared with other Asia-Pacific countries. Private participation in healthcare delivery is increasing in countries such as China, India, Thailand and Australia. Other important drivers expected to encourage hospitals in Asia-Pacific to implement HIS are the increase in medical tourism and the growth of the health insurance market.

Objectives of the study:

- To find out whether the mid size hospitals are potential segment for HIS.
- To find out the features and services which are specifically required by mid size hospitals.

Research Methodology:

The Purpose of the Methodology section is to describe the research procedure.

1. **Research Design:** The study is exploratory in nature and statistical in design.

2. Data Collection Method:

i. **Primary Data** was obtained from Hospital administrators or In charge of Computer divisions of respective hospitals through self administered questionnaire method.

ii. **Secondary Data** was collected from a series of articles published in e-health online journal and other journals through extensive library and internet search.

3. **Sampling: Sample Size:** 30 Hospitals (Maharashtra = 20 Karnataka = 10)

Sampling Procedure: Non probability sampling by Convenience method.

4. **Field Work:** Small size hospitals (50-150) beds were selected.

Questionnaire Development: Questionnaire was prepared and necessary changes were made and final questions were drafted and used for the survey.

Analysis and Interpretation: Analysis and Interpretation of the data was carried out by statistical tools to deduce the conclusion.

Results and Discussion:

According to the survey conducted in Maharashtra and Karnataka, a comparative assessment is done regarding perception of software and its requirements in small size healthcare sector.

1. Requirement of HIS and Factors for HIS selection:

Figure1: Requirement of HIS software

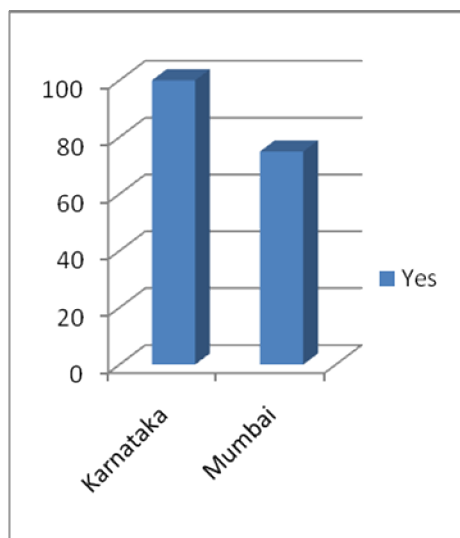
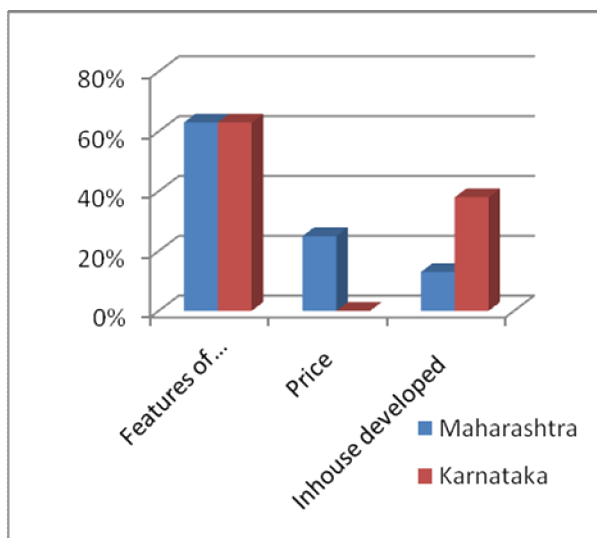


Figure2: Factors which prompted to buy the software

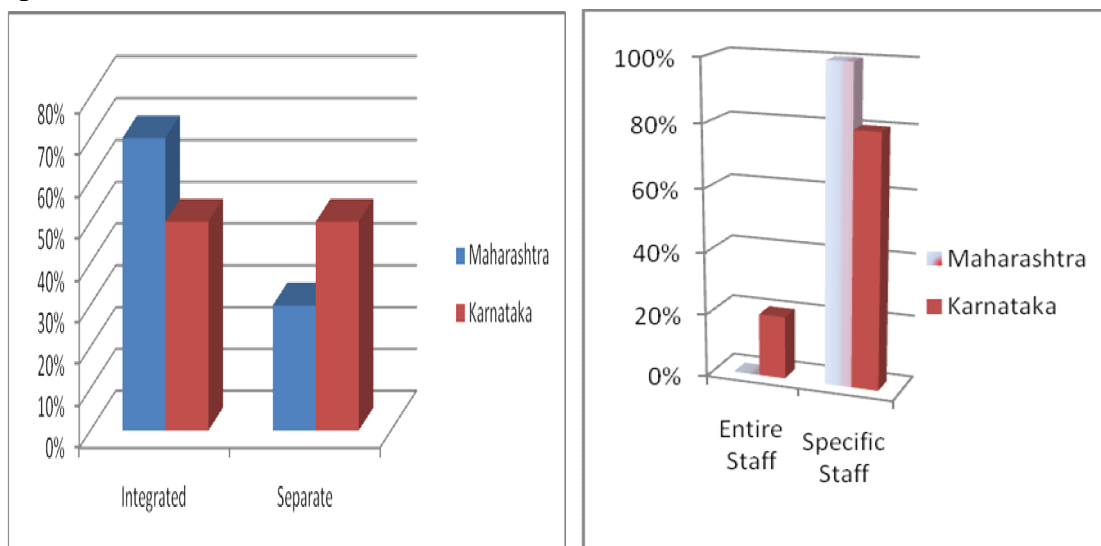


(Fig:1)As per the survey only 75% of the hospitals in Maharashtra have admitted that they require a HIS as compared to Karnataka where 100% hospitals emphasised the need of HIS so as to automate their functions.

(Fig2) shows that in Maharashtra and Karnataka both, first preference was given to the features of the software. Price of the software is the second deciding factor. Some hospitals also go in to develop their own HIS according to their respective requirements and have a inhouse support team also.

2. Preference for integrated or separate software and Training specifications for the staff

Figure: 3 Preference for Laboratory and Pharmacy software Figure 4: Training specifications for the staff



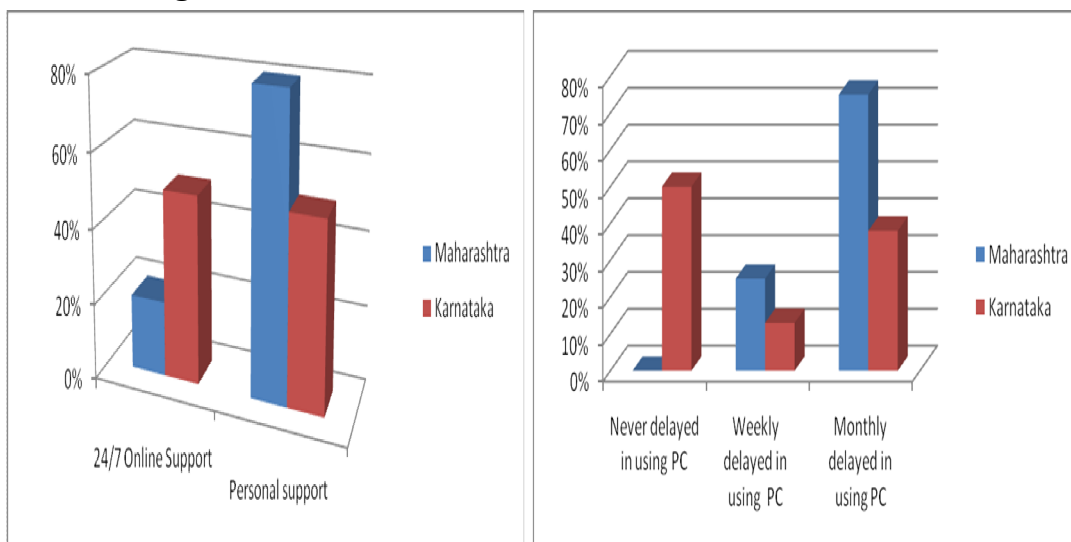
(Fig:3) In Maharashtra 70% of the hospitals preferred integrated software where as in Karnataka 50% hospitals opted for integrated software

(Fig 4)All the hospitals (100%) in Maharashtra reported to opt for training for their specific staff only i.e. only the employees which are going to handle a perticular function should be trained about it. Whereas in Karnataka 80% of the hospitals opted for an specific staff training while 20% of the hospitals preferred to train their entire staff regarding the HIS. This would help them to reduce the delay in hospital functioning by switching over the employees.

3. Training and Support and workflow due to machine malfunctioning

Figure 5: Support required malfunctioning

Figure 6: Delay in workflow due to machine



(Fig 5.) Support can also be provided to a hospital either online or by personal technical staff. According to 20% of the hospitals in Maharashtra went for 24 hours online support system where as 80% preferred the manual technical assistance. The situation of Karnataka is little

different. Here 50% of the hospitals opted online support and remaining 50% preferred the manual technical support. Karnataka is more technology savvy, this is clearly evident from greater acceptance of online training and support systems as compared to Maharashtra.

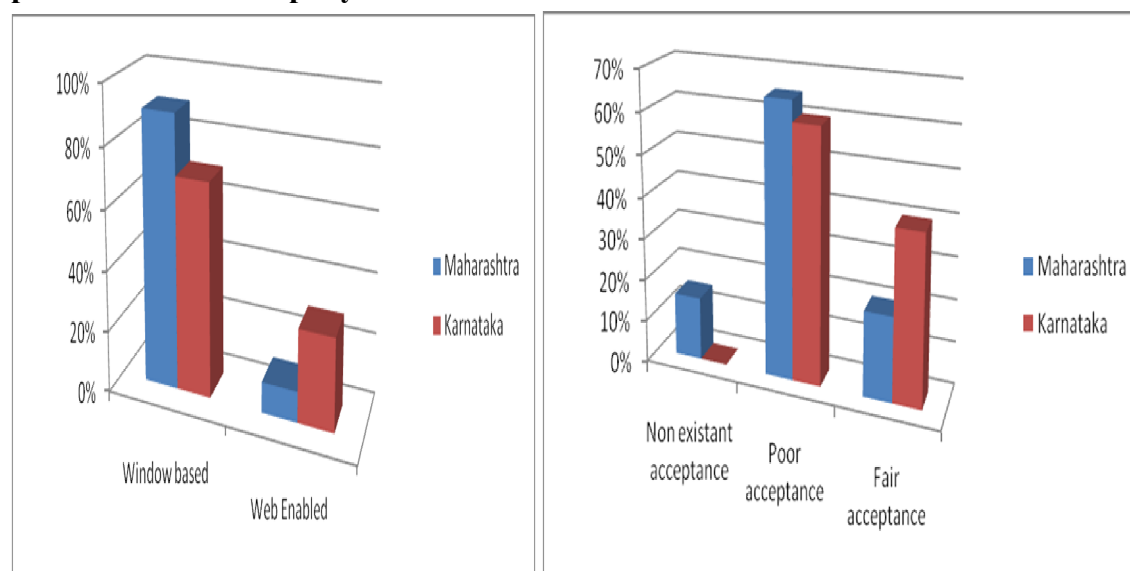
(Fig6) shows that 50% of the Karnataka hospitals have never faced delay in workflow due to machine related problems while 13% of the hospitals have faced the problem on weekly basis. 38% of the hospitals have reported to face the problem per month.

4. Operating System requirement and HIS as a part of promotional plan of a pharmaceutical company

The hospitals surveyed questioned about their preference for the operating system. Window based softwares are the ones which are used commonly to support small to mid size hospitals and Web enabled softwares can be linked to internet if need arises.

Web based and web enabled softwares are much expensive and symbolize the advancement in technology.

Figure 7: Operating system requirements **Figure 8: HIS as a part of promotional plan of a pharmaceutical company**

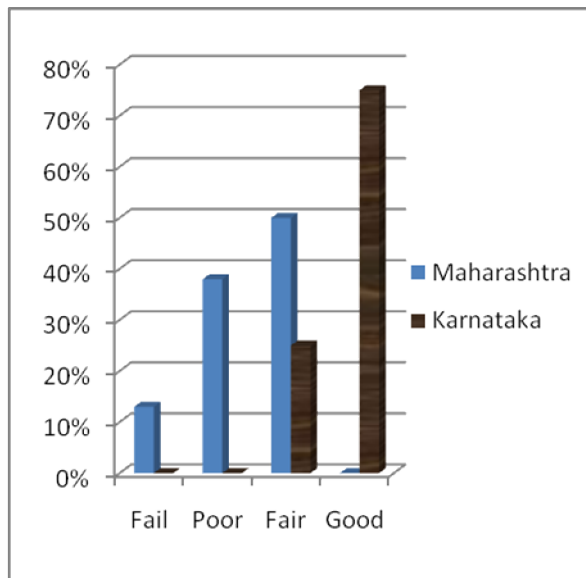
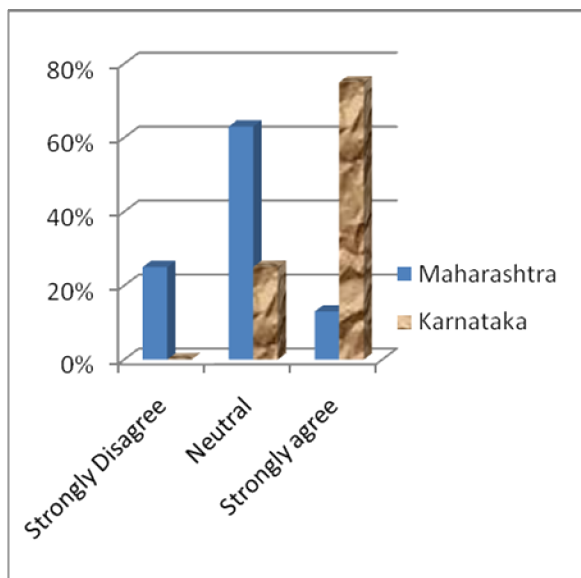


(Fig 7) In Maharashtra only 10% of the hospitals were interested in Web enabled solutions as compared to Karnataka where 30% of the hospitals preferred to install a web enabled software. Thus web enabled versions of the HIS have a better market in Karnataka.

(Fig 8) In Maharashtra responded with 15% of non existant acceptance towards this form of promotion, 65% of the hospitals had poor acceptance where as only 20% of the hospitals had fair acceptance towards this method of launch and promotion. While in Karnataka 40% of the hospitals had fair acceptance for this way of promotion where as 60% of the hospitals gave it a poor acceptance. This is an upcoming trend and will take some time to gain momentum.

5. Current system is worth the time and effort required to use it and Success of the software system

Figure 9: Current system is worth the time and effort required to use it Figure 10: Success of the software system



(Fig9) In Maharashtra 25% of the hospitals strongly disagree with the fact that the system they are using currently is worth the time and effort required to use it while 63% of the hospitals were neutral to the fact which shows that the presence of a HIS does not have a major impact on their functioning, reason for this indifferent approach may be due to improper implementation of the system. Only 13% of the hospitals in Maharashtra strongly agreed to the fact. As far as Karnataka is concerned, the hospitals had a higher rate of satisfaction with HIS. None of the hospitals disagreed with the fact that the software they are using is worth the time and effort required to use it, while 25% of the hospitals were neutral to the fact and a majority of them i.e., 75% strongly agreed with the statement.

(Fig 10) depicts the success of the HIS. 13% of the hospitals in Maharashtra reported that their HIS implementation has failed while 37% hospitals admitted that the success rate of their implementation is poor as the HIS has not come up to their performance expectation. 50% hospitals reported to have fair success rate where as none of the hospitals were completely satisfied with the system (good success). In Karnataka none of the hospitals surveyed admitted to have poor or failed implementation. They had a good success rate with 25% of the hospitals reporting fair success and 75% of the hospitals reporting good success rate.

Thus the success rate and user satisfaction in Karnataka is much better than that in Maharashtra.

Conclusion:

- Maharashtra has a huge potential for HIS market. Only 40% of the hospitals surveyed were automated. More over 55% of the hospitals are below 150 bed size. This brings in light a huge unexploited market of small size hospitals. Though awareness regarding benefits of the HIS is less and thus less no. of hospitals are willing to automate. Success rate of HIS in Maharashtra is very low as compared to Karnataka. Among the 40% of the automated hospitals a less percentage was completely satisfied with the system they were using. Thus Maharashtra has a big market of hospitals which are unsatisfied with the present solution and are looking for a change.
- Thus Maharashtra market has huge potential which can be catered with simple software and strong service and support. New promotional features such as hardware on rent and promotion through pharmaceutical company are moderately accepted in Maharashtra.

Healthcare industry in Karnataka is technology oriented. 78% of the hospitals surveyed were automated. Thus Karnataka has been exploited well the HIS companies. Due to higher technology orientation a majority of hospitals emphasized on HIS as compared to Maharashtra. Success rate of HIS is very high in Karnataka. Most of the HIS using hospitals are satisfied with the system. Cost is not a limiting factor for software implementation in Karnataka. More hospitals prefer in-house solutions as compared to Maharashtra.

- The Karnataka is well saturated and the success rate of present software is high. The focus in Karnataka market should be on High end products such as Web Enabled software and strong online support systems. New promotional features such as hardware on rent and promotion through pharmaceutical company have a good acceptance. Thus these features can be implemented and their pilot study can be conducted

References:

1. HEALTHCARE MANAGEMENT Current Issue | Archives
[online]. [cited 2009 march 19]. Available from
http://www.asianhbm.com/healthcare_management/asia_pacific_healthy_market.htm
2. Measuring the Cost Impact of Hospital Information Systems: 1987-1994.
[online]. [cited 2009 march 12]. Available from
<http://www.federalreserve.gov/pubs/feds/2002/200242/200242pap.pdf>
3. Questionnaire Based Usability Evaluation of Hospital Information Systems
[online]. [cited 2009 march 21]. Available from
<http://www.ejise.com/volume-7/v7-iss-1/v7-i1-art3-hamborg.pdf>
4. LABORATORY INFORMATION SYSTEMS
[online]. [cited 2009 April 2]. Available from
<http://www.biohealthmatics.com/technologies/his/lis.aspx>
5. PHARMACY INFORMATION SYSTEMS
[online]. [cited 2009 April 2]. Available from
<http://www.biohealthmatics.com/technologies/his/pis.aspx>
6. *RADIOLOGY INFORMATION SYSTEM*
[online]. [cited 2009 April 2]. Available from
<http://www.biohealthmatics.com/technologies/his/ris.aspx>
7. *PACS (PICTURE ARCHIVING COMMUNICATION SYSTEM)*
[online]. [cited 2009 April 2]. Available from
<http://www.biohealthmatics.com/technologies/his/pacs.aspx>
8. IT @ HOSPITAL Survey 2008, Part - II, West India
[online]. [cited 2009 Feb19]. Available from
http://www.ehealthonline.org/articles/magpdf_info.asp?id=pdf/September_08.pdf
9. IT @ Hospital Survey 2008, Part- III - South and Central India
[online]. [cited 2009 Feb19]. Available from
http://www.ehealthonline.org/articles/magpdf_info.asp?id=pdf/November_08.pdf
10. IT @ Hospital Survey 2008, Part- I - North India
[online]. [cited 2009 Feb. 21]. Available from
http://www.ehealthonline.org/articles/magpdf_info.asp?id=pdf/August_08.pdf
11. Use of and attitudes to a hospital information system by medical secretaries, nurses and physicians deprived of the paper-based medical record: a case report. BMC

- Med Inform Decis Mak. 2004; 4: 18.
[online]. [cited 2009 march 10]. Available from
<http://www.biomedcentral.com/1472-6947/4/18/additional/>
12. Extent of Use, Perceptions, and Knowledge of a Hospital Information System by Staff Physicians
[online]. [cited 2009 march 30]. Available from
http://hayajneh.startlogic.com/research/Extent_of_Use_.pdf
13. Pay-per-use? Concept in Healthcare: A Grounded Theory Perspective
[online]. [cited 2009 April 14]. Available from
<http://www2.computer.org/portal/web/csdl/doi/10.1109/HICSS.2003.1174369>
14. HOSPITAL INFORMATION SYSTEM IN MEDICARE
- AN EXPERIENCE AT TATA MAIN HOSPITAL, JAMSHEDPUR
[online]. [cited 2009 April 16]. Available from
<http://medind.nic.in/haa/t01/i1/haat01i1p70o.pdf>
15. Making the Business Case for Hospital Information Systems—A Kaiser Permanente Investment Decision
[online]. [cited 2009 April 7]. Available from
www.kpihp.org/publications/docs/business_case.pdf
16. Evaluating computerized health information systems: hard lessons still to be learnt.
BMJ 2003;326:860-863 (19 April) , Information in practice
[online]. [cited 2009 march 3]. Available from
<http://www.bmj.com/cgi/content/full/326/7394/860>.
17. Understanding the Implementation of an Electronic Hospital Information System in a Developing Country: A Case Study from Pakistan
<http://crpit.com/confpapers/CRPITV97Malik.pdf>