Pre and post operative physiotherapy for patients after open-heart surgery

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ABSTRACT
The purpose of this prospective survey was to investigate the pre and postoperative physiotherapy treatment used on patients undergoing open heart surgery. Survey involved physiotherapists working in cardiothoracic units throughout Karachi.

METHOD:
A cross-sectional, descriptive study was carried out to know the practice of physiotherapy following routine open heart surgery in Karachi. Patients having neurological symptoms, restricted lung disease, obstructed lung disease, cardiac vise unstable (New York association grade iii to grade IV, redo surgeries, emergency procedure and patients having excesses weight were not considered.

Result: Results showed that 95% of respondents performed routine preoperative physiotherapy; however 100% treat all patients during post-operative period of open heart surgery.

Conclusion: The result of this survey shows that pre and post-operative management of patients undergoing open heart surgery is done more or less in the same way by physiotherapists throughout Karachi. Verbal interview with the physiotherapists show that practice is mainly based on personnel preference. Awareness of recent literature might influence care of postoperative patients and will influence evidence based practice.

KEY WORDS: Open heart surgery, Physiotherapy, Post-operative management, Awareness, Obstructed lung disease, Restricted lung disease

INTRODUCTION
Cardiac surgery was started in the year 1893, when Dr Danial Hall Willium from Chicago successfully operated a patient having stab wound involving the pericardium and the heart (DH, 1897) the first Aortic surgery was performed by Theodore Tuffier on 13 of July 1912 to open a stenotic valve(T, 1914). Initially clearly documented coronary artery bypass surgery was successfully performed on human being at Ethen Hospital in the New York City on May 2, 1960 by Dr Robert H Goetz (Konstantinov E, 2000). The evidence based perioperative physiotherapy treatment and techniques for patient’s care are not well established. Traditionally, patients have been assessed by physiotherapist before operation, then again assessed in the immediate post-operative period, while still patient is intubated (Patman S, 2001), (Brasher PA, 2003). From that period, physiotherapy treatments start and continued after patients was extubated and shifted to recovery room. Throughout hospital stay patients are treated with deep breathing exercises, incentive spirometry, and gradual mobilization. Prior to discharge from the hospital proper education regarding sternal restriction, supported coughing, pain management, posture correction and healthy life style have been given to the patients. Several studies have challenged the need for this historically protocol, arguing that this management is not necessary for all patients and thus may not be the best use of physiotherapy resources (Patman S, 2001) (ThornlowDK, 1995) in addition to this, the efficacy of incentive spirometry, (Pasquina, 2003)(Fanning, 2004) (OverendTJ, 2001), deep breathing and coughing (Pasquina, 2003) has not been found, in term of patients out comes after uncomplicated CABG surgery (Brasher PA, 2003) (Jenkins SC, 1989)(Stiller, 1994).

On the basis of these studies level and type of care provided by physiotherapists to patients undergoing heart surgery require clarification. physiotherapy is given to reduced post-operative respiratory complications like arterial hypoxemia, Atelectasis and pulmonary infection. These respiratory complications are main causes of morbidity and mortality after open heart operation (Crowe JM, 1979)(Matte P, 2000) (OikkenhenM, 1991)(Westerdhal E, 2005). These techniques and treatment are also used to reduced secondary
complications i.e. pain and stiffness, Improve mobility, functions and enhance, postoperative quality of life (Herdy, 2008)(Peric, 2008). However evidence suggests that some interventions recently used in physiotherapy may be of no benefit to patients undergoing uncomplicated open heart surgery. Chest physiotherapy during intubation period following cardiac surgery does not improve pulmonary complications (Patman S, 2001). Deep breathing exercises (DBEs) has no value to patients undergoing uncomplicated open heart surgery compared early mobilization alone (Brasher PA, 2003)(Jenkins SC, 1989)(Jenkins, 1990)(Johnson, 1995) (Pasquina, 2003) (Stillers, 1994). Percussion, intermittent positive pressure breathing (IPPB), incentive spirometry and continuous positive airway pressure (CPAP) also has no benefit. (MatteP, 2000). In contrast positive expiratory pressure (PEP) therapy using blow bottle device reduces atelectasis and improves pulmonary function compare to controls performing deep breathing with no device or no deep breathing exercises (Westerdahl, 2001) (Westerdhal E, 2005), but evidence does not support its clinical implications. Some researchers showed benefits of thoracic and upper limb range of motion (ROM) exercises but results are not constant across trials. (Aida, 2000)(Shaw, 1989)(Stillers, 1997). Progressive mobilization and walking training are the strongest suggestion for the management of patients underwent open heart surgery. Patients who covered longer distance, recover earlier, got greater walking capacity and mentally satisfaction at discharge from the hospital than their counterpart. (Hirschorn, 2008)(Van, Vilet Vililand TPM, & Versteegh MIM, 2004).

Researchers suggests that some physiotherapy techniques have no benefit to patients undergoing uncomplicated cardiac surgery. During intubation period physiotherapy does not alter the rate of respiratory complications (Patman S, 2001). This was despite available evidence (DullJL, 1983) (Jenkins, 1990) (Stillers, 1994) (CroweJM, 1997) (Brasher PA, 2003)(savci, 2006) that suggested that deep breathing exercises do not improve clinical outcomes in routine, uncomplicated patients. Tucker(Tucker B, 1996)r et al (1996) concluded that physiotherapists were “reluctant to change current practice based on research findings.” Since 1996, the evidence base regarding the benefits of open heart management strategies has grown considerably (Brasher, McClelland, Denehy, and Story, 2003; Hirschhorn(Hirschorn, 2008) et al, 2008; Matte, Jacquet, Van Dyck, and Goenen, 2000; Atman, S(McConnell AK, 2004)Anderson, and Blackmore, 2001; Van der Peijl et al, 2004; Westerdahl, Lindmark, Almgren and Tenling, 2001; Westerdahl et al, 2005). These new findings support the need for a current overview of practices.

Methodology
A questionnaire based survey was done, to identify the physiotherapy management of patients and mobilization procedures after uncomplicated open heart surgery in Karachi district. Inclusion and exclusion criteria were verbally explained to all respondents. Inclusion criteria were elective openheart surgeries (MVR, AVR, DVR, CABG, VSD, ASD, and TC) patients with no lung disease, age limit above 20 year and below 60 year and physiotherapists having work experience of more than one year in cardiothoracic unit. The exclusion criteria were patients having restricted or obstructed lung disease, cardiac wise unstable, redo and emergency surgeries, patients with neurological deficit, circulatory problems, prolonged intubation, or other conditions calling for personalized treatment. Physiotherapists having work experience less than one year in cardiothoracic unit. Physiotherapists that cure other varieties of post-operative patients, requested to precede back the questionnaire unreciprocated. Target population was the cardiothoracic physiotherapists working in both private and public sectors in Karachi, where open heart surgeries have been performed. Non- probability convenience sampling technique was used. Sample size was 40 respondents. Open heart surgery is highly specialized in all large cities of the Pakistan, as in other cities of the developed countries. In Karachi cardiac surgery is performed in both private and government institutions. This study was
conducted in four private and two government sector hospitals in Karachi, where cardiothoracic physiotherapist are performing pre and post-operative physiotherapy regularly.

For this specific study the questionnaire was developed. Previous questionnaire survey performed by (Tucker B, 1996), (Reeve J, 2006) and (Westerdahl, 2011) were reviewed to meet the objective of this study before starting the survey. Questionnaire was designed by the author using expert understanding and clinical proficiency of almost 30 years in the field of cardiothoracic physical therapy. A range of closed ended questions about treatments and techniques used in pre and post-operative periods in patients undergoing coronary artery bypass graft surgery were included in the questionnaire. Duration of the study was from January 2012 to March 2012. Descriptive statistics were used to analyze the results, means, medians, standard deviation and ranges were calculated. SPSS 19.0 (IBM) was used for the statistical analysis.

Result

A questionnaire was sent to forty physiotherapists working at the cardiothoracic units in the leading hospitals of Karachi. 13 (33%) were male and 26 (67%) were female. Physiotherapists were aged between 29.6±1.81. Mean experience was 6.2±2 years with standard deviation of 6.46. Results were analyzed using the statistical package for social sciences (SPSS) Version 19 by IBM.

<table>
<thead>
<tr>
<th>NUMBER (%) OF RESPONDENT PROVIDING PRE-OPERATIVE INFORMATIONS REGARDING DEEP BREATHING EXERCISES, COUGHING / HOUFFING &amp; TECHNIQUES FOR GETTING IN AND OUT OF BED/CHAIR TO THEIR PATIENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESPONSE</td>
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<tr>
<td>----------</td>
</tr>
<tr>
<td>YES</td>
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<tr>
<td>NO</td>
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<tr>
<td>NO RESPONSE</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>NUMBER (%) OF RESPONDENTS PROVIDE INFORMATION ABOUT UPPER &amp; LOWER EXTREMITY EXERCISES, INCENTIVE SPIROMETRY &amp; USE OF DEVICES TO STRENGTHEN INSPIRATORY MUSCLES</th>
</tr>
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<tr>
<td>RESPONSE</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>YES</td>
</tr>
<tr>
<td>NO</td>
</tr>
<tr>
<td>NO RESPONSE</td>
</tr>
</tbody>
</table>
### TABLE III

**NUMBER (%) OF RESPONDENT PROVIDING PRE-OPERATIVE INFORMATIONS REGARDING, EARLY MOBILATION, POST STERNOTOMY RESTRICTION & POST OPERATIVE PULMONARY COMPLICATIONS.**

<table>
<thead>
<tr>
<th>RESPONSE</th>
<th>PRE-OPERATIVE INFORMATION REGARDING EARLY MOBILATION</th>
<th>POST STERNOTOMY RESTRICTION</th>
<th>POST OPERATIVE PULMONARY COMPLICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>37 (9.25%)</td>
<td>35 (87.5%)</td>
<td>35 (87.5%)</td>
</tr>
<tr>
<td>NO</td>
<td>2 (5%)</td>
<td>5 (12.5%)</td>
<td>3 (7.5%)</td>
</tr>
<tr>
<td>NO RESPONSE</td>
<td>1 (2.5%)</td>
<td>------</td>
<td>2 (5%)</td>
</tr>
</tbody>
</table>

### TABLE IV

**NUMBER (%) OF RESPONDENT PROVIDING INFORMATION ABOUT USE OF BILATERAL SHOULDER MOVEMENT, STERNAL PRECAUTION AFTER DISCHARGE & HOME EXERCISES.**

<table>
<thead>
<tr>
<th>RESPONSE</th>
<th>USE OF BILATERAL SHOULDER MOVEMENT</th>
<th>STERNAL PRECAUTION AFTER DISCHARGE</th>
<th>HOME EXERCISES</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES</td>
<td>34 (85%)</td>
<td>30 (75%)</td>
<td>35 (87.5%)</td>
</tr>
<tr>
<td>NO</td>
<td>6 (15%)</td>
<td>4 (10%)</td>
<td>5 (12.5%)</td>
</tr>
<tr>
<td>NO RESPONSE</td>
<td>------</td>
<td>6 (15%)</td>
<td>------</td>
</tr>
</tbody>
</table>

Table V shows that 75% respondents provide written guide/booklet to their patients at the time of discharge.
FIGURE I

If a patient’s first post-operative day falls on Sunday, do you give physiotherapy treatment?

- Routinely: 57.66%
- If Needed: 31.11%
- Never: 11.23%

FIGURE II

If a patient’s second postoperative day falls on Sunday, do you give physiotherapy treatment?

- Routinely: 83.33%
- If Needed: 11.11%
- Never: 5.56%

Figure II shows that If second postoperative day fall on sound, 83.33% respondents visit their patients regularly.

Discussion
To our knowledge this is a first survey to explore pre and postoperative physiotherapy management following uncomplicated open heart surgeries in Karachi. These types of survey to know the current practice among the physiotherapist working in the cardiothoracic unit were also performed by (Tucker B, 1996), (ReeveJ, 2006) and Westerdahl (Westerdahl, 2011).
In this study 95% respondents informed patients about pre-operative information regarding, deep breathing, mobilization supported coughing, range of motion exercises and post-operative sternotomy restrictions to the patient, while 30% respondent use devices to strengthen inspiratory muscle of the patients. Deep breathing exercises (95%) and incentive spirometry (92.5%) treatment techniques are not supported by current evidence, (DullJL, 1983), (Jenkins, 1990), (Stiller, 1994) (Brasher PA, 2003) (savci, 2006), continue to be widely used among cardiothoracic physiotherapist. Tucker (Tucker B, 1996) described that 34 of 35 respondents (97%) used either cough or deep breathing exercises, while (Filbay, Hayes, & Holland, 2011) reported that 77% of respondent used this technique in the management of routine post-operative patients undergoing cardiac surgery. These results suggest that in the past 14 years implementation of deep breathing exercises has been decrease, on the other hand, finding of this survey indicates that DBE are the most commonly used technique, as 95% of respondents are still using deep breathing exercises regardless mounting evidence of no value. Implementation of early Mobilization (92.5%) was frequently used intervention among cardiothoracic physiotherapists and has sound evidence supported by recent literature (Hirschorn, 2008).

Manual techniques like percussion and vibration may be harmful to the patients in Cardiac surgery because of risk of sternum instability and has no positive effects (Jenkins SC, 1989), (Barerel, 1978),] (Johnson, 1995) , (Matte P, 2000), (OikkenenM, 1991). Literatures mention very little about this technique (Felcar JM, 2008) had discussed this technique in pediatric cardiac surgery. in this study 71% respondents, agree that percussion technique used in postoperative period might cause sternal instability and induce pain so it should be avoided, while 29% respondents agreed that percussion might not induce pain and sternum harm.

.15% respondents used InspiratoryResistance Positive Expiratory Pressure device (IR-PEP) blow bottle in the post operative period. Resultsshowed that 95% respondents perform preoperative physiotherapy ,whereas post operative physiotherapy was utilized routinely by all cardiothoracic physiotherapists.Soulder range of motion exercises are used topprogress blood circulation, reserve thoracic motion and affluence sternal circulation (Shaw, 1989).Bilateral upper limb movements causes less sternal pain as compared to unilateral movements (El-Ansary D, 2007). In this study 82% respondents performed bilateral shoulder movement, 87.5% provided written guide /booklet to the patients. Written guideline about exercise therapy after cardiac surgery frequently progresses self-confidence, diminishes menace issues, and can upsurge bodily capability and medical status of the patients.(Graham I, 2007)A recent research report showed that after cardiac surgery home based cardiac rehabilitation program (HBCR) was realistic and safe compare to the conservative in hospital rehabilitation. According to this study, large number of individuals, who have underwent uncomplicated cardiac surgery may benefit from home based cardiac rehabilitation program using telemedicine.(Scalvini S, 2013)

Post-operative sternal unsteadiness is a main problem, so importance of correct instruction for sternal precaution is crucial particularly in obese and chronic obstructive pulmonary disease patients (Diez, 2007).85% respondents provide sternal precaution at the time of discharge On Sunday 81.08 % respondent have managed post-operative patients, 8.11% respondent have attained only if needed while 10.81 % never give physiotherapy .Physiotherapy interventions routinely performed for patients undergoing uncomplicated cardiac surgery. It is important to note that this survey data shows only a sample of current physiotherapy practice in Karachi and might not reflect the ideal care of this patient’s population. Research is needed to allocate evidence to clarify practice in various areas such as treatment frequency, use of specific treatment techniques, sternal precaution and lifting restrictions. Tucker made two remarkable points in their discussion: first, that, in most of the hospitals, treatment of patients after bypass surgery may be more comprehensive than is supportable by the results of clinical research, and second that “physiotherapists are
reluctant to change current practice based on research findings.” (Tucker B, 1996). Reeve and Ewan also concluded that many physiotherapists are unwilling to change practice based on the available evidence on treatment techniques in this patient population (Reeve & Evan, 2005). While all aspects of the routine physical therapy administration of patients following heart surgery not yet conducted in any systematic review, evidence has arose to suggest that use of at least some traditional treatment techniques and practices should be reconsidered (Patman S, 2001), (Jenkins SC, 1989), (Pasquina, 2003), (Stiller, 1994), (Overend TJ, 2001) (Parker RD A. J., 2008)In this study the treatment choice was mainly influence on personal choice, experience, surgeon recommendations and hospital policy. Recent literature influence was not reflected in practice as most patient were treated with deep breathing exercises (95%), despite literature consistently proving that deep breathing has no benefit. A recent study (Filbay, Hayes, & Holland, 2011) shows that respondents with a bachelor or diploma in physiotherapy were more likely to used breathing techniques or coughing than physiotherapist with a post graduate degree, physiotherapists with more advance education may be more inclined to use evidence-based practice, which may interconnected to their extended understanding in their field obtained by extensive research skills achieved while obtaining a postgraduate degree. Davidson (IlesR, 2006) study showed that physiotherapists with advanced levels of training were more confident in their ability to search databases and did so more frequently than physiotherapists with lower levels of education.

Eduardo and Weiner P also studied efficacies of inspiratory muscle training in patients undergoing heart surgery. (Hulzebos, 2006) In a specific type of scientific experiment, of patients experiencing cardiac surgery concluded as rigorous workout of muscles of inhalation (7 episodes weekly for minimum fifteen days) former to surgery decreases occurrence of respiratory complications and hospital stay in high risk population of patients after surgery). Endurance and strengthening training of inspiratory muscle in preoperative period causes increased resistance to fatigue and enhanced respiratory function by decreasing the work of breathing and increasing pulmonary reserve (Enright SJ, 2006), (McConnell AK, 2004) in this study 30% respondent used inspiratory muscle training device. It means that use of this device is uncommon in this population of cardiothoracic physiotherapist. A recent study showed that inspiratory muscle training device can be used in the high risk patients to prevent postoperative pneumonia, but results of the study were questionable to support the proof for inspiratory muscle training in tumbling the occurrence of this post-operative pulmonary complication, so more investigations are needed to know its effect in regular care of patients.(Valkenet K, 2013)

**Conclusion**

It is concluded that, to augment evidence based practice, physiotherapists working in cardiac surgery unit should rationalize and validate their treatments and techniques and conduct new research. Cardiothoracic physiotherapists may benefit by means of proper evidence-based guidelines for use on routine, uncomplicated open heart cardiac patients. These guidelines would make specific recommendations regarding physiotherapy management and the evidence on which they are based.

**Limitation of Study**

Since many questions were not answered, so author only considered those questions, which were commonly attained by the respondents. As this study collected information’s regarding self-reported physiotherapy practice for treatment of patients undergoing open heart surgeries. It may be possible that physiotherapists’ response in a manner they thought represented acceptable practice, and thus may be our result may not reflect the actual management provided by respondents.
Abbreviations
CABG: Coronary Artery Bypass Graft Surgery
CPR: Cardiopulmonary resuscitation
DBE: Deep Breathing Exercises
SpO2: Oxyhaemoglobin saturation
LOS: Length of Stay
IS: Incentive spirometry
SP: Sternal Precaution
MI: Myocardial Infarction
MIP: Maximal Inspiratory Pressure
MEP: Maximal Expiratory Pressure
IPPB: Intermittent Positive Pressure Breathing
IR-PEP: Inspiratory Resistance Positive Expiratory Pressure
PPCs: Post-Operative Pulmonary Complication’s
PVD: Peripheral Vascular Disease
AVR: Aortic Valve Replacement
MVR: Mitral Valve Replacement
DVR: Double Valve Replacement
TC: Total Correction
ASD: Atrial Septal Defect
HBCR: Home Based Cardiac Rehabilitation

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