

**EVALUATION OF MANUAL PATIENT HANDLING ACTIVITY TO REDUCE
MUSCULOSKELETAL DISORDERS WITH MOVEMENT AND ASSISTANCE
ON HOSPITAL PATIENT
(STUDY CASE R.S MUHAMMADIYAH BANDUNG)**

**EVALUASI AKTIVITAS HANDLING PASIEN UNTUK MENGURANGI RISIKO
GANGGUAN MUSKULOSKELETAL DENGAN MOVEMENT AND
ASSISTANCE ON HOSPITAL PATIENT
(STUDY CASE R.S MUHAMMADIYAH BANDUNG)**

Amanda Puspita Permata Sari¹, Rino Andias Anugraha², Yusuf Nugroho Doyo Yekti³

Industrial Engineering, Engineering Faculty, Universitas Telkom

[1puspitaamanda@students.telkomuniversity.ac.id](mailto:puspitaamanda@students.telkomuniversity.ac.id), [2pak.rino@gmail.com](mailto:pak.rino@gmail.com), [3dovovekti2010@gmail.com](mailto:dovovekti2010@gmail.com)

Abstract

Handling activities tend to raise a risk of musculoskeletal disorders or MSDs when it implement with wrong method. One of handling activities which have a high risk of MSDs is nursing activity. This study aims to assess the risk of MSDs among nurses in different wards on Muhammadiyah hospital by means of MAPO (Movement and Assistance of Hospital Patient) method. The study was conducted in 13 sections of Muhammadiyah subspecialty hospital including 111 wards. Exposed nursing staff (N=30) were asked to report MSDs experiences in the past one year. The results indicated that 3 units are on the red category, 6 units are on the yellow category, and 4 units come on green category. Lifting factor indicates the high level of patient handling activity. However minor factor aids showed very bad results. We can conclude this activity raises the risk of MSDs for nurses. The other factors such environmental about 27%, training factor 35% and also wheelchair factor 43% need to meet the best requirement to perform the proper handling activity on every ward. It is therefore necessary to implement an ergonomic program in order to modify the observed baneful condition as soon as possible..

Kata kunci : manual handling, patient handling, MAPO Index, movement and assistance of hospital patient, musculoskeletal disorders

Abstrak

Aktivitas handling cenderung meningkatkan risiko gangguan muskuloskeletal atau MSDs ketika dilakukan dengan metode yang salah. Salah satu kegiatan handling yang memiliki risiko MSDs tinggi yaitu aktivitas keperawatan. Penelitian ini bertujuan untuk menilai risiko MSDs antara perawat di bangsal yang berbeda pada rumah sakit Muhammadiyah dengan menggunakan MAPO (Movement and Assistance on Hospital Patient). Penelitian dilakukan di 13 unit di RS Muhammadiyah terdiri dari 111 ruangan yang diteliti. Beberapa staff perawat (N = 30) diminta untuk melaporkan pengalaman MSDs dalam satu tahun terakhir. Hasil penelitian menunjukkan bahwa 3 unit berada pada kategori merah, 6 unit pada kategori kuning, dan 4 unit pada kategori hijau. Lifting factor adalah salah satu komponen yang terdapat dalam perhitungan MAPO Index. Namun minor aids factor menunjukkan hasil yang sangat buruk, karena hamper tidak ada alat bantu sederhana yang digunakan untuk menunjang kebutuhan aktivitas patient handling. Dapat disimpulkan bahwa aktivitas ini cenderung menimbulkan risiko MSDs untuk perawat. Faktor lainnya seperti environmental sebesar 27%, training factor 35%, dan juga wheelchair factor 43% masih harus memenuhi persyaratan untuk melakukan aktivitas penanganan yang tepat pada setiap bangsal. Oleh karena itu sangat dibutuhkan beberapa program yang sesuai dengan kriteria ergonomi untuk mengurangi risiko sesegera mungkin.

Keywords: manual handling, pengangkatan pasien, MAPO Index, movement and assistance of hospital patient, musculoskeletal disorders.

1. Pendahuluan

Preliminary research conducted in Rumah Sakit Muhammadiyah Bandung using Nordic Body Map Questionnaire with 30 samples of nurses remains patient handling activity. The following chart calculation results are the 5 biggest complaints using Nordic Body Map. The yield is about 90% nurse experience pain on waist, 70% felt back pain, the other about 67% have pain on left arm, right thigh and left knee. The biggest result show on waist, there are 12 nurses feel little pain, the other 11 are felt pain and 4 of them experienced very pain, almost all nurse experience pain in this body part.

The percentages of these fatigues indicate problems related to the manual patient handling activity. Musculoskeletal disorders (MSDs) describe a complaint that occurs in the muscles of the body due to repeated activity, poor posture, and requires a lot of energy. Complaining of pain can be caused by several factors, including human factors seen from the worker's age, history of disease, lack of training, and even the lifting frequency can affect the magnitude of MSDs risk. Another factor is whether the tools used are sufficient or not, in addition to the methods of work and lack of proper environment is also a cause of the complaint. This Figure below show the factors that affect the pain of handling activity.

Pain on waist body part is common as Low Back Pain(LBP), national survey in Canada confirmed of almost 19000 nurses do indeed have higher rates of LBP (Yassi, Annalee: 2013). Other study said that MSDs were the most commonly reported as occupational illness, and LBP is the common as major public problem regarding the nursing activities. From reviews that have been done among nursing personnel in Italy, it was shown that LBP prevalence rates have varied widely ranging from 33% to 86% (Lorusso, Antonio: 2007). According to North American Spain Society, Low Back Pain can cause critical condition if left long without treatment, for some people the problem is not too detrimental to health, but for all cases of pain lasting longer than three weeks, medical evaluation is advised such medication, treatment, or spinal injection.

Therefore, this study will analyze the factors that affect patient handling activity such as tools and work environments around to reduce the risk of musculoskeletal disorders on nurses in manual patient handling activities. And also designing a good working system for nurses to reduce the risk of musculoskeletal disorders, designing a safe system of work for nurses during manual handling activities, reduce Risk of accidents that occur as a result of the activity of the manual handling of patients.

2. Method

This study carried out on 13 units involved in patient handling activities. The unit consists of Dewi Sartika, Multazam 1, Multazam 2, Multazam 3, Multazam 4, Multazam 5, Perinatal, Kebidanan, Rhoudhah 3, Rhoudhah 4, Rhoudhah 5, ICU, and General room including 111 wards. MAPO method was applied in order to assess the risk of manual patients handling. Measurement consists of two parts, the first part by an interview with the head nurse of the aspects of the organization and training. While the second part of observation and assessment of the design of the facility and environmental aspects as well as aspects of the equipment used in patient handling activities. The following are factors that affect the value of MAPO index:

Disabled Patient/Operator Ratios; To measure the burden of nursing activities performed are considerations such as the type of patients treated is Non-Cooperative patient and Partially Cooperative Patient. Partially Cooperative Patient is a patient in need of nurses for a particular activity, but not entirely because patients in this category can perform most activities independently. Non-Cooperative Patients, are fully in need of nurses as patients with paralysis, stroke or other serious diseases.

Lifting Factor; is measured by assessing the number of tools used and the number of patient needs in the manual handling activities. Criteria inadequate tool in this method that aids cannot be used for normal patients, or tool is often damaged. The value used in the calculation of lifting factor is 0.5 to 4.

Minor Aids Factor; Simple tools such as sliding sheet, transfer disc, roller, and belt ergonomics can reduce the risk of accidents from certain activities. The tools can be used with the main transfer. Value of 0.5 is used when there is a tool that is used, whereas if the patient handling activities do not use tools to be larger value that is equal to 1.

Wheelchair Factor; Assessment of wheelchairs and/or commodes considers two aspects in an integrated manner: sufficient number as compared to the number of disabled patients; and presence of ergonomic requirements. A sufficient number means the presence of a number of wheelchairs equal to at least half of the number of disabled patients in the unit.

Environmental Factor; This factor covers analysis of bathrooms, toilets and wards. For each section, the number of inadequacy features is identified. The highest scores (1 or 2) are assigned to environmental aspects which, if inadequate, enforce the operators to perform a higher number of manual patient transfer.

Training Factor; the last factor determines the specific training of operators. A reducing value of 0.75 was assigned to the cases of adequate training (theoretical and practical exercises on techniques for lifting PC patients with the least overload). When training simply provided information (verbally or via leaflets), a TF of 1 was assigned. When no training was given, a TF of 2 was assigned.

The ratios NC/Op and PC/Op are "weighted" with respect to "lifting" and "minor aids" factors, respectively, in order to assess the potential biomechanical overload produced by transfer operations according to the presence/absence and suitability of the aids under study. MAPO index calculation in general as follows:

$$\text{MAPO} = [(\text{NC/OP} \times \text{LF}) + (\text{PC/OP} \times \text{AF})] \times \text{WF} \times \text{EF} \times \text{TF}$$

MAPO score describe how much the value of the risk posed by the patient handling activities. There are three categories on the score MAPO, green category indicates that the activity has a low risk. Yellow category indicates that the patient handling activities at risk. At this level, it is Necessary to perform a medium-and long-term intervention plan to address the issues of health surveillance, aid equipment, and training. Category red depicts a greater risk. In this case, a short-term intervention plan must be performed to address the issues of health surveillance, aid equipment, training, and environment.

3. Result

3.1 Calculations

Based on the MAPO Index calculation the conclusion there are three units categorized into Red band Multazam 3, Multazam 4 and Perawatan Umum each units index sequentially follows 9.64; 6.83 and 9.63. On yellow band consists of 6 units are PK (kebidanan), ICU, Perinatal, Multazam 5, Multazam 1, and Multazam 2. The negligible risks show on units Dewi Sartika, Raudhah 3, Raudhah 4, and Raudhah 5.

Table 1 MAPO Index category

NO	UNIT	MAPO INDEX	CATEGORY	ACTION
1	Dewi Sartika	1.36	Green	Negligible safe
2	Multazam 1	4.59	Yellow	Need improvement in the medium to long term to eliminate risk
3	Muktazam 2	3.43	Yellow	Need improvement in the medium to long term to eliminate risk
4	Multazam 3	9.64	Red	Need improvement in the short term to eliminate risk factors
5	Muktazam 4	6.83	Red	Need improvement in the short term to eliminate risk factors
6	Multazam 5	2.54	Yellow	Need improvement in the medium to long term to eliminate risk
7	Perawatan Umum	9.63	Red	Need improvement in the short term to eliminate risk factors
8	PK (Kebidanan)	1.56	Yellow	Need improvement in the medium to long term to eliminate risk
9	Perinatal	1.97	Yellow	Need improvement in the medium to long term to eliminate risk
10	ICU	1.95	Yellow	Need improvement in the medium to long term to eliminate risk
11	Raudhah 3	1.25	Green	Negligible safe
12	Raudhah 4	1.04	Green	Negligible safe
13	Raudhah 5	0.32	Green	Negligible safe

There are several factors which affect a score. Table 2 shows an analysis of single risk determinants of patient manual handling. Analysis of single factors associated with MAPO index level may be the basis for a risk reduction plan in order to identify intervention priorities and specific actions to decrease exposure level. Then to determine the state of each room in more detail can be done by classifying each factor into MAPO assessment, the first category is sufficient and adequate condition, the second condition is met either one of those categories was sufficient or adequate, and the last condition is absent indicates that the unit is not considered one of the variables in MAPO Index.

Table 2 Analysis of single risk determinant

FACTOR	Sufficient and Adequate (%)	Inadequate or Insufficient (%)	Absent or fully inadequate (%)	Total Wards
Lifting Factor	0	59	54	98
Minor Aids Factor	0	0	100	103
Environmental	50	27	0	111
Wheelchair Factor	57	43	0	111
Training Factor	65	35	0	111

*The total number of ward where LF or AF is indicate is less than 111 because they are only relevant in wards that have non-cooperative or partially cooperative patients

Three units have been defined as the high risky category they are Multazam 3, Multazam 5 and Perawatan Umum. Our focused are on these three units to improve the conditions of several factors. About 36% of lifting factor are on category fully inadequate device, 100% minor aids are absent in these three units, then 70% environmental factor are insufficient/inadequate conditions, the other factor is wheelchair perform 44% of these three units comes on inadequate/insufficient category, the last but not least is training factor, 54% are on inadequate/insufficient category. It can be concluded that the three units are dominate criteria of bad condition, so it needs some improvements to each factor.

3.2 Root Cause Analysis

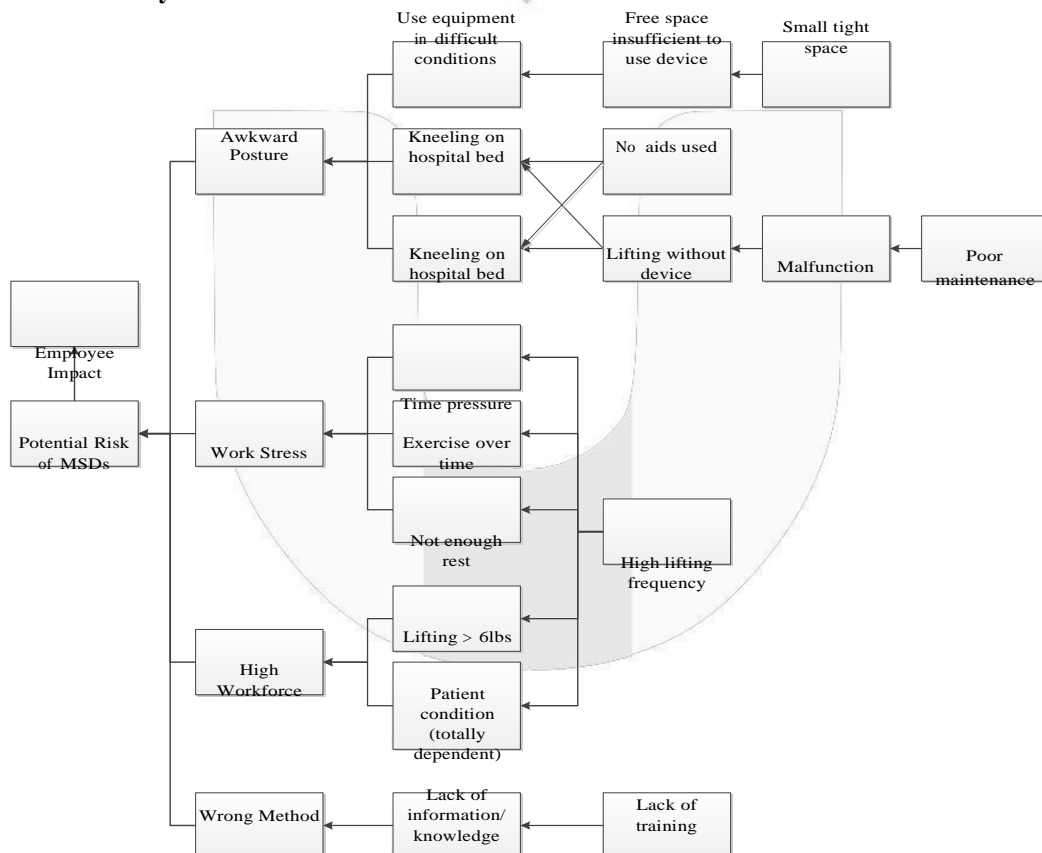


Figure 1 Root cause diagram

These are several basic problems that have been identified as follow:

1. Small tight space; show that the environmental factor has to be improved.
2. No aids used; describe inadequate tiny device for example to reduce friction to meet handling activity requirements.
3. Poor maintenance; indicated inappropriate monitoring, supervision and maintenance of device regarding the patient handling activity.
4. High lifting frequency; become one of causes that determine the high lifting value. High value means the activity has high risk value.
5. Lack of training; showed low ability of nurses in performing their duties.

3.3 Hierarchy of control recommendations

The solutions come from the problems that have been identified using root cause analysis. This hierarchy of control solved the problem from the first stage of intervention. The solution can be seen in the order of priority that must be done according to the percentage of every factor. The first factor is minor aids, then environmental factor, training factor, wheelchair factor, and then lifting factor.

Table V. 7 Hierarchy of Control Problem Definition

Here are the proper way to reduce some inappropriate conditions, this hierarchy has two rationales in reducing the risk that is through lowering the probability of accidents or exposure and reduce the severity of an accident or exposure.

- a. Small tight space; a better solution are combine with three hierarchy to meet the better working conditions. Elimination is not properly to implement because in this case a problem need to solve in a short term. Substitution, engineering control and administrative control may have a better combination to prevent this basic problem.

Control:

- Reallocate patient for every room, using standard rule. Room with big space used for room class which has a biggest patient allocation.
- Redesign the layout of room used. Place the important device which suit to a patient conditions.
- Make a safety operating procedure to minimize hazards.

- b. No aids used; Elimination was have been done in the past, but there are a lot of obstacle such safety patient problem and take more time to perform. The better performance may use engineering control and administrative control.

Control:

- Used a device while doing a patient ambulation from bed to bed, wheelchair to bed or vice versa, minimum a minor aids to reduce or eliminate the manual patient handling and reduce the friction such as slide sheet, or even a piece of sheet. So the activity will be easier to do.
- Making appropriate procedure when nurse lift patient manually

- c. Poor maintenance device; a better way to reduce risk probability and risk frequency are use engineering control and administrative control. The elimination control may a good condition but it is for long term intervention.

Control:

- Doing a periodically maintenance for example about two weeks or in a month.
- Recording list, this is important to know the broken device, or poor maintenance device. So logistic could make a quick prevention.

- d. High lifting tasks; all hierarchy level are probably could make a better working conditions. First level has high priority then the next level, if first levels do not possible to implement, next level will be better and it will continue after the last hierarchy. A combination between the levels could be a good choice.

Control:

- Eliminate manual handling activity; nurses do not need to transfer a patient from an emergency bed to a gurney then to inpatient beds when all the beds have the same specifications. When patients come in, then the transfer is only done once from an emergency bed to inpatient beds.
- Replace the handling method; in this hospital moving patient from bed to bed, wheelchair to bed or vice versa are done without any aids or lifting device so better to replace the method by using harness or hoists.

- Additional nurse involved to do the manual activity so it will make a pressure work more relaxed. It will also reduce a lack of breaks because nurses have more time to relaxing.
 - Shift rotation to reduce stress. The purpose is to reduce the workload that has accumulated on a person only.
 - Health monitoring, this is the first stage to indicate a risk. If any, nurse or several parts can prevent a big risk in the future.
- e. Lack of training; this is better to do engineering control and administrative control because the previous levels (elimination, substitution and isolation) are not possible to implements. So a combination between these two levels (engineering control and administrative control) are a possible way to fixed this problem.
- Control:
- Periodically training; this training are useful especially for a new employee/ nurse. If costs become an obstacle, training can held by hospital itself. Several person following a license training or course then they share it to all nursing personnel in the hospital.
 - Assess the training effectiveness by.

4. Conclusion

Based on the research that has been done regarding to manual patient handling activity in R.S Muhammadiyah with MAPO (Movement and Assisstance of Patient Handling), it can be concluded as follows:

1. MAPO Index indicates 3 units are on the red category, 6 units are on the yellow category, and 4 units come on green category. The three units on the red category are Multazam 3 with value of 9.64; Multazam 4 with value of 6.83 and 9.63 for Perawatan Umum.
2. About 36% of lifting factor are on category fully inadequate device, 100% minor aids are absent in these three units, then 70% environmental factor are insufficient/inadequate conditions, the other factor is wheelchair perform 44% of these three units comes on inadequate/insufficient category, the last but not least is training factor, 54% are on inadequate/insufficient category.
3. The priorities of improvement based on the biggest percentage sequentially are minor aids factor, environmental factor, training factor, wheelchair factor, and lifting factor.
4. The basic problems that perform in this hospital are no minor aids, small tight space, nurse time pressure, inadequate supervision and lack of training on several units.
5. Some action plans that have been agreed by hospital party are procurement of minor aids, device and side grip; health monitoring program and maintenance record on logistic activity.

References

- [1] Battevi, et al., "MAPO index for risk assessment of patient manual handling in hospital wards: a validation study", Research Unit Ergonomics of Posture and Movement: 2006.
- [2] Kroemer, K.H.E., Kroemer, H.B., Kroemer-Elbert, K.E, "Ergonomics: How to Design for Ease and Efficiency", 2nd Edition, Penerbit Prentice Hall, Inc., Upper Saddle River, New Jersey. USA, 2001.
- [3] Lorusso, Antonio, "A review of Low Back Pain and Musculoskeletal Disorders among Italian Nursing Personal". Jurnal Industrial Health, 2007.
- [4] Mahnaz Saremi^{1,a*}, Fatemeh Khayati², "Evaluation of Ergonomic Risk of Manual Handling of Patients With MAPO Index and Its Relationship with Incidence of Low Back Pain among Nurses", Faculty of Health, Safety and Environment:2013.
- [5] Menoni, et al., "Assessment of Exposure to Manual Patient Handling in Hospital Wards: MAPO Index (Movement and Assistance of Hospital Patients)", CRC Journal: 2005.
- [6] Nurmianto, Eko, "Ergonomi: Konsep Dasar dan Aplikasinya". Surabaya: Guna Widya, 1996.
- [7] Saremi, Mahnaz, et al., "Evaluation of Ergonomic Risk of Manual Handling of Patients with MAPO Index and Its Relationship with Incidence of Low Back Pain among Nurses", Advanced Engineering Forum Vol. 10, 2013
- [8] Satalaksana, "Teknik Perencanaan Sistem Kerja", Edisi Kedua, Penerbit: ITB Bandung.
- [9] Tarwaka, "Ergonomi industri: Dasar-dasar pengetahuan ergonomi dan aplikasi dalam lingkungan kerja", Edisi kedua, Solo: Harapan Press Solo, 2014.
- [10] Wignjosoebroto, Sritomo, et al., "Perancangan Lingkungan Kerja dan Alat Bantu yang Ergonomis untuk Mengurangi Masalah Back Injury dan Tingkat Kecelakaan Kerja pada Departemen Mesin Bubut". Jurnal Institut Teknologi Sepuluh Nopember (ITS). Surabaya.
- [11] Yasi, Annalee., "Work Relatedness of Low Back Pain in Nursing Personal", Global Health Research Program: 2013.
- [12] Yunita, Made., "Proposed of design manual material handling method in loading process of beans to reduce the risk of msds using biomechanical approach.". Final Project S1Teknik Industri, Telkom University, Bandung, 2013.

