A Comparative Study of Regulatory Requirements and Guidelines for Medical Devices In USA, Japan And Canada

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Abstract: A **medical device** is any apparatus, appliance, software, material, or other article for the purpose of diagnosis, prevention, monitoring, treatment, or alleviation of disease. The global medical device market reached roughly $209 billion in 2006. The United States (U.S.) regulates medical devices using a classification system based on the risk to the patient from using the device. Medical devices are classified into Class I (least risk), II, and III (most risk). Regulatory control increases from Class I to Class III. Japanese healthcare standards are amongst highest in the world and medical device market is largest in the globe. Japan's pharmaceutical and medical device agency (PMDA) is the regulatory body responsible for reviewing medical device application. The PMDA works under Ministry of Health, labor, and Welfare (MHLW) to assess new product safety, develop comprehensive regulations and minority post-market safety. Japan medical device regulations are lead down under pharmaceutical and medical device (PMD) act. Health Canada reviews medical devices to assess their safety, effectiveness and quality before being authorized for sale in Canada. The quality management system is evaluated under the Medical Device Single Audit Program (MDSAP) from Jan 1st, 2019.

Index terms: **Regulatory requirement, Medical devices, Registration, Comparison, USA, JAPAN, CANADA**

1. INTRODUCTION:

A **medical device** is any apparatus, appliance, software, material, or other article—whether used alone or in combination, including the software intended by its manufacturer to be used specifically for diagnostic and/or therapeutic purposes and necessary for its proper application—intended by the manufacturer to be used for human beings for the purpose of:

- diagnosis, prevention, monitoring, treatment, or alleviation of disease;
- diagnosis, monitoring, treatment, relief, or compensation for an injury or handicap;
- investigation, replacement, or modification of the anatomy or of a physiological process;
- control of construct; and which does not achieve its principal intended action in or on the human body by pharmacological, immunological, or metabolic means, but which may be assisted in its function by such means[1]

Medical devices vary according to their intended use and indications. examples range from simple devices such as tongue depressors, medical thermometers, and disposable gloves to advanced devices such as computers which assist in the conduct of medical testing, implants, and prostheses. items as intricate as housings for cochlear implants are manufactured through the deep drawn and shallow drawn manufacturing processes. the design of medical devices constitutes a major segment of the field of engineering. The global medical device market reached roughly $209 billion in 2006. [2]

2. DISCUSSION:

❖ MEDICAL DEVICES IN USA

FDA defines a medical device as:

- an instrument, apparatus, implement, machine, contrivance, implant, in vitro reagent, or other similar or related article, including a component part or accessory which is: recognized in the official National Formulary, or the United States Pharmacopoeia.
- intended for use in the diagnosis of disease or other conditions, or in the cure, mitigation, treatment, or prevention of disease, in man or other animals, or
- intended to affect the structure or any function of the body of man or other animals, and which does not achieve its primary intended purposes through chemical action within or on the body of man or other animals and which is not dependent upon being metabolized for the accomplishment of any of its primary intended purposes. [3]

➢ CLASSIFICATION OF MEDICAL DEVICES

The Food and Drug Administration (FDA) has constituted classifications for around 1,700 different generic types of devices and grouped them into 16 medical specialties referred to as panels. Each of these generic types of devices is assigned to one of three regulatory classes based on the level of control necessary to assure the safety and effectiveness of the device. The three classes and the requirements which apply to them are:

➢ Device Class and Regulatory Controls

1. Class I General Controls
   - With Exemptions
   - Without Exemptions

2. Class II General Controls and Special Controls
   - With Exemptions
   - Without Exemptions

3.Class III General Controls and Premarket Approval

The class to which your device is assigned determines, among other things, the type of premarketing submission/application required for FDA clearance to market. If your device is classified as Class I or II, and if it is not exempt, a 510k will be required for marketing. All devices classified as exempt are subject to the limitations on exemptions. Limitations of device exemptions are covered under 21 CFR xxx.9, where xxx refers to Parts 862-892. For Class III devices, a premarket approval application (PMA) will be required unless your device is a pre-amendments device (on the market prior to the passage of the medical device amendments in 1976, or substantially equivalent to such a device) and PMA's have not been called for. In that case, a 510k will be the route to market. [4]
Device classification depends on the *intended use* of the device and also upon *indications for use*. For example, a scalpel's intended use is to cut tissue. A subset of intended use arises when a more specialized indication is added in the device's labelling such as, for making incisions in the cornea. [4]

❖ MEDICAL DEVICES IN JAPAN

The definition of a medical device in Japan is similar to the U.S. definition. A device is defined as an instrument or apparatus intended for use diagnosing, curing, or preventing diseases in humans or animals, or intended to affect the structure or functions of the bodies of humans or animals. [5]

➢ CLASSIFICATION OF MEDICAL DEVICES

For medical devices manufactured, imported and/or sold in Japan, Japanese Medical Device Nomenclature (JMDN) codes and generic names are set with reference to the medical device names determined in the ISO/TC210 GMDN project. Then, generic names are classified to Class I, II, III or IV according to their risk level. These classifications were determined by reference to the classification rule of GHTF (Global Harmonization Task Force).

- **Class I Devices**: General Medical Devices – The risk to patients in the event of malfunction is regarded as almost negligible (e.g. s-ray Film)
- **Class II Devices:** Controlled Medical Devices – The risk to patients in the event of malfunction is regarded as relatively low (e.g. MRI, digestive catheters)
- **Class III Devices:** Specially Controlled Medical Devices – The risk to patients in the event of malfunction is regarded as relatively high (e.g. artificial bones, dialyzer)
- **Class IV Devices:** Specially Controlled Medical Devices **–** The device is highly invasive with potentially fatal risk to patients (e.g. pacemaker, artificial heart valves) [5]

❖ MEDICAL DEVICE IN CANADA

The term medical devices, as defined in the Food and Drugs Act, covers a wide range of health or medical instruments used in the treatment, mitigation, diagnosis or prevention of a disease or abnormal physical condition. Health Canada reviews medical devices to evaluate their safety, effectiveness, and quality before authorizing their sale in Canada. [6]

➢ CLASSIFICATION OF MEDICAL DEVICES

The regulatory authorities recognize different classes of medical devices based on their design complexity, their use characteristics, and their possible for harm if misused. Each country or region defines these categories in different ways. The authorities also recognize that some devices are provided in combination with drugs, and regulation of these combination products takes this factor into consideration.

The Medical Devices Bureau of Health Canada recognize four classes of medical devices based on the level of control necessary to assure the safety and effectiveness of the device. Class I devices present the lowest potential risk and do not require a licence. Class II devices require the manufacturer's declaration of device safety and effectiveness, whereas Class III and IV devices present a greater potential risk and are subject to in-depth examination. A guidance document for device classification is published by Health Canada. Canadian classes of medical devices correspond to the European Council Directive 93/42/EEC (MDD) devices:

- Class IV (Canada) generally corresponds to Class III (ECD),
- Class III (Canada) generally corresponds to Class IIb (ECD),
- Class II (Canada) generally corresponds to Class IIa (ECD), and
- Class I (Canada) generally corresponds to Class I (ECD).

Examples include surgical instruments (Class I), contact lenses and ultrasound scanners (Class II), orthopaedic implants and haemodialysis machines (Class III), and cardiac pacemakers (Class IV).[6]

3. COMPARATIVE STUDY OF REGULATORY REQUIREMENTS BETWEEN THE USA, JAPAN AND CANADA.

Table 1: Comparison of regulatory requirements for medical device

Requirements	**USA**		**JAPAN**		**CANADA**	
Regulatory authority	Food and Drug Administration (US FDA)		Pharmaceutical Medical Devices Agency (PMDA)		Health Canada	
Classification	**Class I** e.g., stethoscopes, medical gloves **Class II** e.g., x-rays, needles **Class III** e.g., pacemakers, heart valve		**Class I** e.g., x-ray Film **Class II** e.g., MRI, digestive catheters **Class III** e.g., artificial bones, dialyzer **Class IV** e.g., pacemaker, artificial heart valves		**Class I** e.g., Surgical instrument **Class II** e.g., Contact lenses, ultrasound scanner **Class III** e.g., orthopaedic implant, haemodialysis machines, **Class IV** e.g., Cardiac pacemakers	
Regulatory requirements	• Establishment registration • Premarket notification or premarket approval (PMA) • Investigational device exemption • Quality system regulation (QSR) • Labeling requirements • Medical device reporting		• Appoint Marketing Authorization Holder (MAH or D-MAH) • Foreign Manufacturer Registration (FMR) • Quality Management System (QMS) • Pre-Market Submission • Pre-Market Certification • Quality management system		• Establishment license • Medical device license • Investigational testing • Safety and effectiveness • requirement • Quality system regulation • Labeling requirements • Medical device reporting	
Time period for registration	**Class I**	1 month	**Class I**	<1 month	**Class I**	2-4 months
	Class II	6-9 months	**Class II**	3-5 months or 7-9 months	**Class II**	1-2 months
	Class III	18-30 months	**Class III**	9-11 months	**Class III**	4-5 months
			Class IV	13-16 months	**Class IV**	6-8 months
Validity of License	**Class I**	Does not expire	**Class I**	Does not expire	**Class I**	1 year
	Class II	Does not expire	**Class II**	Does not expire	**Class II**	1 year
	Class III	Does not expire	**Class III**	Does not expire	**Class III**	1 year

			Class IV	Does not expire	**Class IV**	1 year
Renewal of Registration period	**Class I**	Does not expire	**Class I**	Does not expire	**Class I**	2 months
	Class II	Does not expire	**Class II**	Does not expire	**Class II**	2 months
	Class III	Does not expire	**Class III**	Does not expire	**Class III**	2 months
			Class IV	Does not expire	**Class IV**	2 months
Cost for regulatory approval	**Class I**	<$5,000	**Class I**	$5,000-$15,000	**Class I**	$15,000-$30,000
	Class II	$15,000-$30,000	**Class II**	$30,000-$50,000	**Class II**	<$5,000
	Class III	$50,000 or more	**Class III**	$50,000 or more	**Class III**	$50,000 or more
			Class IV	$50,000 or more	**Class IV**	$40,000 or more

4. CONCLUSION

- The United States (U.S.) regulates medical devices using a classification system based on the risk to the patient from using the device. Class I devices can generally be sold without preapproval. While Class II devices must receive prior clearance from the FDA before they can be sold in the U.S. The clearance process is known as "premarket notification". Most Class III devices must undergo a more exacting and expensive process, typically requiring clinical trials, known as "premarket approval" (PMA) before they can be sold in the U.S.
- Regulatory pathway of Japan, it is determined by device classification according to the Japan Pharmaceutical Affairs Law (PAL) and Japanese Pharmaceutical and Medical Device Act (PMD Act). After that applicant has to appoint Marketing Authorization Holder or designated Marketing authorization holder (MAH or D-MAH) who manages approval procedure of product in Japan.
- To sell a medical device in Canada, manufacturers must meet the regulatory requirements as defined in the Medical Devices Regulations. Class I medical devices offered for sale in Canada do not require a medical device licence and are monitored through Establishment Licensing. Class II, III, and IV medical devices offered for sale in Canada require a medical device license. To successfully apply for a medical device, license the manufacturer must submit supporting documentation to demonstrate its safety and effectiveness.

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