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Original Research Article

Prescribing Patterns of Pharmacological Agents for Nociceptive and Nociplastic Chronic Pain in a Physical Medicine and Rehabilitation Outpatient Department: A Cross-Sectional Observational Study

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Abstract

Background: Chronic pain, particularly nociceptive and nociplastic types, imposes a significant burden on patients and healthcare systems. While nociceptive pain arises from tissue damage, nociplastic pain stems from central sensitization without clear injury. Appropriate pharmacological strategies are essential but often vary in real-world settings.

Objectives: The present study aimed to evaluate the prescribing patterns of analgesic and adjunctive medications for chronic nociceptive and nociplastic pain in an outpatient setting and to assess treatment adherence, effectiveness, and adverse drug reactions (ADRs).

Materials and Methods: A cross-sectional observational study was conducted at the Department of Physical Medicine and Rehabilitation of a tertiary care teaching hospital in eastern India over a period of one year. A total of 97 patients aged 18 years and above with nociceptive or nociplastic chronic pain were enrolled. Drug utilization patterns were analyzed based on prescriptions from the first and last visits. Pain intensity was assessed using the Visual Analogue Scale (VAS), adherence using the MMAS-8 scale, and ADRs using WHO-UMC, Naranjo, and Hartwig-Seigel assessment tools.

Results: Multidrug therapy involving gabapentinoids, NSAIDs, and paracetamol was common at the initial visit, while later prescriptions showed a shift toward gabapentinoid monotherapy. The mean VAS score declined from 4.13 to 2.99, and 75.26% of patients reported improvement in quality of life. High adherence (MMAS-8 score = 8) was noted in 72.18% of patients. ADRs were mostly mild, with only one patient requiring hospitalization.

Conclusion: The study highlights a rational trend in pharmacological management of chronic pain, favouring simplified, mechanism-based therapy with good adherence and safety outcomes. Regular monitoring and individualized therapy may further optimize pain management strategies in similar outpatient settings.

Keywords: Chronic pain, Nociceptive pain, Nociplastic pain, Prescribing Patterns, adverse drug reactions (ADRs).

Introduction

Pain is a pervasive and complex public health concern that often poses an extensive physical, emotional, and socioeconomic burden and impairs the quality of life of the individual as well as the family. The International Association for the Study of Pain (IASP) defines pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" [1]. It is not merely a symptom as described often but has a vast physiological and psychological dimension to be treated as a disease entity itself and imposes a significant burden on the healthcare system [2]. Chronic pain (typically defined as pain persisting >3 months) in particular, poses a major global health concern affecting 1 in every 5 adults approximately [3]. Historically, Pain has been classified into many categories based on its

duration, clinical presentation and underlying mechanism [4]. In 2016, an international consensus classified pain in 3 broad categories, i.e., nociceptive, neuropathic, and nociplastic respectively [5]. Their intent was to improve diagnostic accuracy, facilitate communication between stakeholders, and simplify mechanism-based management strategies. Nociceptive pain, arising from actual or threatened tissue damage, is typically localized and responsive to anti-inflammatory or analgesic therapies [6].

In contrast, nociplastic pain arises from altered central nociceptive processing without any evident peripheral or neural injury and is characterized by heightened pain sensitivity, allodynia, and overlapping somatic symptoms [7,8]. Neuropathic pain is caused by injury or dysfunction in the nervous system, leading to abnormal pain processing [9]. It is caused by the damage to peripheral nerves or central nervous system components results in spontaneous stimulation of pain pathway due to sensory nerve hyperexcitability, central sensitization, and maladaptive plasticity [10].

Pharmacological management is fundamental in the treatment of chronic pain. Drugs are prescribed based on the pain subtype and tailored to individual patient [11]. For example, in case of nociceptive pain, non-steroidal anti-inflammatory drugs (NSAIDs), acetaminophen, and opioids are frequently used [12]. Whereas, in nociplastic pain, centrally acting agents such as tricyclic antidepressants (TCAs), serotonin-norepinephrine reuptake inhibitors (SNRIs), and gabapentinoids are often recommended due to their role in modulating central sensitization [13]. Drug utilization research (DUR), as defined by the World Health Organization, plays a pivotal role in identifying trends in prescribing practices and promoting rational drug use in these cases [14,15].

In India, where there is a limited access to proper health care, patient education, and necessary resources, comprehensive data on pharmacological treatment patterns in chronic pain, particularly nociceptive and nociplastic subtypes are relatively scarce. Additionally, despite existing guidelines, prescribing patterns are often influenced by physician preference, drug availability, comorbid conditions, and socioeconomic factors of the patients, potentially resulting in suboptimal or irrational prescribing practices [16,17].

There is a relative paucity of robust data on the prescribing patterns for nociceptive and nociplastic pain, particularly in Eastern India. While some previous studies have explored the prevalence of chronic pain and its impact, data on drug-specific utilization and treatment outcomes remain limited [18].

So, this study aimed to evaluate the prescribing patterns, effectiveness, safety, and patient adherence associated with pharmacological treatment of chronic nociceptive and nociplastic pain among patients attending the Outpatient Department (OPD) of Physical Medicine and Rehabilitation (PMR) at NRS Medical College and Hospital.

Materials and Methods

Study design and study setting: This is a cross-sectional observational study, carried out in the Outpatient Department of Physical Medicine and Rehabilitation (PMR) at Nil Ratan Sircar Medical College and Hospital, Kolkata, a tertiary care teaching hospital in eastern India. The study was conducted over for a period of 18 months from July 2023 to December, 2024 after obtaining approval from the Institutional Ethics Committee.

Study Population: Adult patients (>18 years of age), attending the outpatient department of Physical Medicine & Rehabilitation during the study period, who were diagnosed with nociceptive or nociplastic chronic pain by a specialist and gave written informed consent was included in the study.

Patients with neuropathic pain, cognitive impairment, pregnancy, lactation, hepatic or renal impairment, or those unwilling to provide informed consent were excluded.

Sample Size: The minimum sample size was calculated using a standard formula based on a chronic pain prevalence of 19.3%, [3] with a 95% confidence interval, 10% margin of error and a 20% attrition rate. A total of 97 patients fulfilling the inclusion and exclusion criteria were enrolled after obtaining written informed consent.

Study Instruments and Variables: For the present study, a set of study instruments was used including a valid prescription (prescribed by the physicians) and structured case record form (administered by the primary investigator) for the demographic details, pain characteristics pattern of utilization of drugs, adverse drug reactions (ADRs), treatment adherence, and quality of life indicators from the first and last outpatient visits of the study participants.

Table 1: List of study instruments and variables

	Study Instruments	Study Variables/ parameters
1	Prescription	1. Sociodemographic Details 2. Pattern of utilization of Drugs
2	Case record form	
3	Visual Analogue Scale	Pain
4	WHO - UMC Scale	ADRs (Causality and Severity)
5	Naranjo Adverse Drug Reaction Probability Scale	
6	Hartwig and Siegel severity assessment scale	ADRs (Severity)
7	SF-36 Questionnaire	Quality of Life
8	MMAS -8 scale	Adherence to treatment

Pain intensity was assessed using the Visual Analogue Scale (VAS), a validated 10-point scale ranging from 0 (no pain) to 10 (worst imaginable pain). To evaluate the impact of pharmacotherapy on quality of life, a simplified version of the SF-36 health survey was administered during the final follow-up visit [19]. The eight-item Morisky Medication Adherence Scale (MMAS-8), a validated tool widely used in adherence research was assessed for Medication adherence. MMAS-8 scores range from 0 to 8, with a score of 8 indicating high adherence, 6 to <8 indicating moderate adherence, and <6 indicating low adherence [20]. All adverse drug reactions (ADRs) reported by patients or observed during clinical evaluation were assessed and categorized using three standard tools: the WHO-Uppsala Monitoring Centre (WHO-UMC) causality assessment scale [21], the Naranjo Adverse Drug Reaction Probability Scale [22], and the Hartwig-Seigel Severity Assessment Scale [23]. The use of these validated complementary tools allowed for a comprehensive evaluation of the probability and severity of each ADR.

Prescribed medications were categorized into different therapeutic classes including NSAIDs, acetaminophen, gabapentinoids, tricyclic antidepressants (TCAs), muscle relaxants, and others. Each drug was further classified based on its brand or generic identity, its inclusion in the National List of Essential Medicines (NLEM) 2022 (essential or non-essential), and its dosage form [24]. Data were collated and analyzed using SPSS (version 26.0). Descriptive statistics were used for qualitative variables (expressed as frequencies and percentages) and quantitative data (mean ± SD). Graphs and tables were generated using Microsoft Excel and Word.

Results

A total of 97 patients were enrolled in the study, comprising 51 males (52.6%) and 46 females (47.4%), with a mean age of 45.26 ± 12.62 years. The majority of participants were in the 31–50-year age group, followed by the 51–70-year age group. The average duration of chronic pain among the study population was approximately 5.2 ± 1.4 months.

Table 2: Demographic characteristics of the study population

Characteristics	Frequency (N=97)	Percent (%)	
Age Group:			Minimum Age: 22 years; Maximum Age: 76 years
20-30	13	13.40	
31-40	28	28.87	
41-50	21	21.65	
51-60	24	24.74	
61-70	8	8.25	
71-80	3	3.09	
Mean Age (+/- SD): 45.26 (+/- 12.62) Years			
Gender:			Male Female Ratio= 1.11:1
Male	51	52.58	
Female	46	47.42	

Prescribing Patterns: Analysis of the prescription data revealed that the majority of patients were initially prescribed combination therapy involving multiple drug classes. On the first visit, 34.02% of prescriptions contained gabapentinoids (Gabapentin or Pregabalin), 30.93% included NSAIDs, and 18.56% comprised Paracetamol either as monotherapy or in combination.

Amitriptyline was also prescribed in 6.18% of cases, primarily in patients diagnosed with nociplastic pain. The use of muscle relaxants, such as Tizanidine, was observed in a minority of prescriptions.

Table 3: Frequency Distribution of Pattern of Drug Use (during First visit)

Drug Regimen Administered	Frequency (N=97)	Percent (%)
Paracetamol (325 mg) + Aceclofenac (100 mg) + Amitriptyline (10 mg)	1	1.03
Ibuprofen (400 mg) +Aceclofenac (100 mg) + Amitriptyline (10 mg)	1	1.03
Paracetamol (325 mg) + Aceclofenac (100 mg)	5	5.15
Paracetamol (325 mg) + Aceclofenac (100 mg) + Amitriptyline (10 mg)	8	8.25
Amitriptyline (10 mg)	3	3.09
Paracetamol (650 mg) + Aceclofenac (100 mg) + Amitriptyline (10 mg)	2	2.06
Amitriptyline (10 mg) + Ibuprofen (400 mg)	10	10.31
Gabapentin (100 mg) + Pregabalin (75 mg) + Aceclofenac (100 mg) + paracetamol (325 mg)	1	1.03
Gabapentin (100 mg) + Pregabalin (75 mg) + Ibuprofen (400 mg)	1	1.03
Gabapentin (100 mg) + paracetamol (325 mg) + Aceclofenac (100 mg)	7	7.22
Gabapentin (100 mg) + Ibuprofen (400 mg)	5	5.15
Gabapentin (100 mg) + Pregabalin (75 mg) + Ibuprofen (400 mg) + paracetamol (325 mg)	18	18.56
Gabapentin (100 mg) + Pregabalin (75 mg) + Aceclofenac (100 mg) + paracetamol (650 mg)	1	1.03
Gabapentin (100 mg) + Pregabalin (75 mg) + Ibuprofen (400 mg)	15	15.46
Gabapentin (100 mg) + Pregabalin (75 mg) + Ibuprofen (400 mg) + Amitriptyline (10 mg)	1	1.03
Ibuprofen (400 mg)	2	2.06
Ibuprofen (400 mg) + Amitriptyline (10 mg)	1	1.03
Pregabalin (75 mg)	1	1.03
Pregabalin (75 mg) + Aceclofenac (100 mg) + Paracetamol (325 mg)	7	7.22
Pregabalin (75 mg) + Aceclofenac (100 mg) + Paracetamol (325 mg) + Ibuprofen (400 mg)	1	1.03
Pregabalin (75 mg) + Ibuprofen (400 mg)	6	6.19
Total	97	100.0

Over the course of follow-up, a distinct shift in prescribing trends was noted. By the final visit, there was a notable reduction in the use of combination therapy. Monotherapy with either Gabapentin (100 mg) or Pregabalin (75 mg) became the most frequently prescribed regimen. This trend suggested a preference for rationalized, centrally acting agents in patients whose pain was classified as nociplastic in nature.

Table 4: Frequency Distribution of Pattern of Drug Use (during Last visit)

Drug Regimen Utilized	Frequency (N=97)	Percent (%)
Paracetamol (325 mg) + Aceclofenac (100 mg)	3	3.09
Paracetamol (325 mg) + Aceclofenac (100 mg) + Amitriptyline (10 mg)	3	3.09
Gabapentin (100 mg) + Pregabalin (75 mg) + Aceclofenac (100 mg) + paracetamol (325 mg)	1	1.03
Amitriptyline (10 mg)	6	6.19
Amitriptyline (10 mg) + Ibuprofen (400 mg) +	1	1.03
Paracetamol (650 mg) + Aceclofenac (100 mg) + Amitriptyline (10 mg)	1	1.03
Amitriptyline (10 mg) + Ibuprofen (400 mg) + paracetamol (325 mg)	6	6.19
Gabapentin (100 mg)	7	7.22
Gabapentin (100 mg) + Paracetamol (325 mg) + Aceclofenac (100 mg)	2	2.06
Gabapentin (100 mg) + Ibuprofen (400 mg)	7	7.22
Gabapentin (100 mg) + Pregabalin (75 mg)	21	21.65
Gabapentin (100 mg) + Pregabalin (75 mg) + Aceclofenac (100 mg)	1	1.03
Gabapentin (100 mg) + Pregabalin (75 mg) + Aceclofenac (100 mg) + paracetamol (325 mg)	9	9.28
Gabapentin (100 mg) + Pregabalin (75 mg) + Amitriptyline (10 mg)	1	1.03
Gabapentin (100 mg) + Pregabalin (75 mg) + Ibuprofen (400 mg)	8	8.25
Gabapentin (100 mg) + Pregabalin (75 mg) + Ibuprofen (400 mg) + Amitriptyline (10 mg)	1	1.03

Ibuprofen (400 mg) + Amitriptyline (10 mg)	3	3.09
Pregabalin (75 mg)	7	7.22
Pregabalin (75 mg) + Aceclofenac (100 mg)	1	1.03
Pregabalin (75 mg) + Aceclofenac (100 mg) + Paracetamol (325 mg)	3	3.09
Pregabalin (75 mg) + Ibuprofen (400 mg)	5	5.15
Total	97	100

Drug Type and Essentiality: Out of the total drugs prescribed, 69.07% were branded medications, whereas 30.93% were prescribed by generic name. Evaluation of essential drug prescribing based on the National List of Essential Medicines (NLEM) 2022 showed that 65.98% of the medications belonged to the essential category, while the remaining 34.02% were non-essential.

Table 5: Frequency Distribution of Type of Drug Administered

Type of Drug	Frequency	Percent (%)
Branded	67	69.07
Generic	30	30.93
Total	97	100.0
Essential Drug	64	65.98
Non-essential Drug	33	34.02
Total	97	100.0

Pain Intensity and Quality of Life: The mean Visual Analogue Scale (VAS) score at the time of the first visit was 4.13 ± 0.77. After the prescribed pharmacotherapy and follow-up, the mean VAS score decreased significantly to 2.99 ± 0.79. This reduction in pain intensity indicated an overall positive response to treatment across the cohort.

Table 6: Frequency distribution of Pain Scale in the study population according to Visual Analogue Scale (VAS)

1st visit			Last visit		
Pain Scale	**Frequency (N=97)**	**Percent (%)**	**Pain Scale**	**Frequency (N=97)**	**Percent (%)**
2	3	3.1	1	4	4.1
3	14	14.4	2	17	17.5
4	47	48.5	3	54	55.7
5	33	34.0	4	20	20.6
Mean Score (+/- SD): 4.13 +/-0.77			5	2	2.1
			Mean Score (+/- SD): 2.99 +/- 0.79		

Quality of life, as assessed by a simplified SF-36 questionnaire, improved in 75.26% of patients by the end of the treatment period. Among these, improvements were most frequently reported in terms of physical functioning and various restrictions due to physical health. (Figure 7)

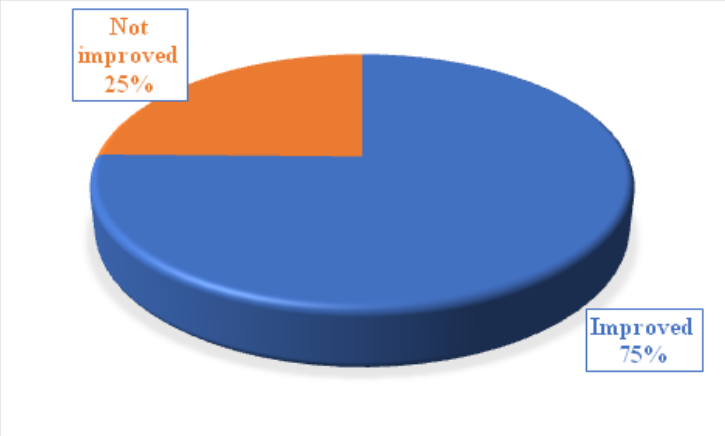

Figure 1: Frequency Distribution of QoL Improvement

Medication Adherence: Assessment of medication adherence using the MMAS-8 scale revealed that 72.18% of the patients demonstrated high adherence (score = 8), while 16.49% showed moderate adherence and 11.34% were classified as low adherents. The average MMAS-8 score was

6.74 ± 2.16. The most common reason for non-adherence was a perceived lack of symptomatic improvement, followed by concerns about side effects and pill burden.

Table 8: Frequency distribution of medication adherence among study population (Acc. to Morisky Medication Adherence Scale-8)

MMAS-8 SCORE	Frequency (N=97)	Percent (%)
2.0	4	4.12
3.0	15	15.46
4.0	5	5.15
7.0	3	3.09
8.0	70	72.18
Mean Score (+/- SD): 6.74 +/- 2.16		

Adverse Drug Reactions (ADRs): A total of 61 adverse drug reactions were reported during the course of the study. Using the WHO-UMC causality assessment scale, 55.67% of ADRs were categorized as "conditional," 23.71% as "possible," and 20.62% as "unclassified." Naranjo's scale indicated that the majority of ADRs (mean score = 3.33 ± 2.66) fell within the "possible" range.

Severity assessment via the Hartwig-Seigel scale revealed that 71.13% of ADRs were mild, 26.80% were moderate, and only one case (1.03%) was classified as severe, requiring hospitalization due to a hypersensitivity reaction.

Table 9: Frequency distribution of occurrence of ADR in the study population according to WHO - UMC Scale

Category	Frequency	Percent (%)
Conditional/Unclassified	54	55.67
Possible	23	23.71
Probable/Likely	5	5.15
Un-assessable/Unclassifiable	5	5.15
Unlikely	10	10.31
Total	97	100.0

No fatalities or life-threatening events were reported during the study period.

Discussion

This cross-sectional study provides a detailed pharmaco-epidemiological assessment of drug prescribing trend, patient adherence, and treatment outcomes among individuals with chronic nociceptive and nociplastic pain. The study findings highlight a shift toward more targeted and rational pharmacological approaches, particularly in the management of nociplastic pain, where gabapentinoid monotherapy gained prominence during follow-up.

The demographic distribution in this study, with a mean age of 45.26 years and a nearly equal male-to-female ratio, reflects the epidemiological profile observed in earlier pain management research from Indian outpatient settings [3]. Middle-aged adults appeared to represent the majority of cases, consistent with previous studies indicating a high prevalence of musculoskeletal disorders and post-traumatic pain syndromes in this age group [25].
At the initiation of therapy, combination regimens were frequently employed. Polypharmacy was particularly prominent in patients presenting with severe or functionally disabling pain. In consensus with the previous research on prescription pattern of pain medications, Gabapentinoids, NSAIDs, and paracetamol were the most commonly co-prescribed drugs [26], reflecting clinical attempts to address both central and peripheral pain mechanisms simultaneously. Over time, however, these multidrug regimens were tapered to monotherapy in most patients, an approach supported by recent literature advocating the use of gabapentinoids as first-line treatment for nociplastic pain syndromes such as fibromyalgia and chronic primary musculoskeletal pain [13,27].

The transition toward monotherapy also aligns with rational drug use principles, particularly given the potential risks associated with long-term NSAID use, including gastrointestinal bleeding and renal toxicity. Notably, 66% of the prescribed drugs belonged to the Indian National List of Essential Medicines (NLEM), suggesting relatively good adherence to national guidelines in a real-world outpatient setting [24].

The significant reduction in pain scores, with mean VAS declining from 4.13 to 2.99, indicates clinically meaningful relief. This is further supported by patient-reported improvements in quality of life, with nearly three-fourths of the cohort experiencing better functioning by the final

visit. These outcomes are consistent with evidence from randomized controlled trials demonstrating the efficacy of gabapentin and pregabalin in chronic pain conditions mediated by central sensitization [18,28].

Adherence to prescribed therapy, assessed using MMAS-8, was notably high in this cohort, with over 70% of patients scoring a perfect 8. While this may partially reflect the structured follow-up and counselling provided at the tertiary centre, it is encouraging in view of the frequent challenge of non-adherence to treatment observed in chronic pain patients. Previous studies have reported lower adherence rates, often attributable to side effects, high pill burden, and perceived ineffectiveness [29-31].

Adverse drug reactions were relatively few, with most falling under the mild category based on the Hartwig-Seigel scale. The majority of ADRs were deemed "possible" or "unclassified" on causality assessment using WHO-UMC and Naranjo's tools. Only one patient experienced a severe ADR necessitating hospitalization, indicating an overall favorable safety profile for the medications used. This supports the continued use of gabapentinoids and other non-opioid agents as core pharmacological options in managing chronic pain, provided they are prescribed and monitored judiciously [32].

This study also offers insights into prescribing trends in the Indian context. Despite national recommendations favouring generic prescriptions, branded drugs comprised 69% of those dispensed. This reflects the persistent influence of pharmaceutical marketing and possible concerns regarding the efficacy of generics among prescribers; a pattern echoed in similar Indian DUR studies [33]. This study offers dual focus on both nociceptive and nociplastic pain, offering comparative insights into pharmacological approaches for distinct pathophysiological entities. While NSAIDs remained prominent in nociceptive cases, nociplastic presentations were more effectively managed with centrally acting agents. This supports a mechanistic, phenotype-based approach to pain management, as advocated by contemporary pain medicine frameworks [34].

This study stands out due to its real-world applicability, comprehensive evaluation of pharmacological treatment trends, adherence assessment, and ADR monitoring. The longitudinal design, objective outcome measurement, and strong ethical standards further reinforce the reliability of the findings. However, this study was conducted at a single tertiary care center and involved a relatively small sample size, which may limit generalizability. Additionally, the diagnosis of nociplastic versus nociceptive pain was made clinically without advanced imaging or neurophysiological tools, which may introduce some classification bias. There was also reliance on self-reported adherence and subjective QoL assessment, which may introduce recall or reporting bias. The cross-sectional design also precludes assessment of long-term treatment outcomes and recurrence rates. Future research should explore objective biomarkers, neuroimaging correlates of nociplastic pain, and integrate non-pharmacological therapies in multimodal pain management approaches.

Conclusion

This study reveals a rational trend in pharmacological management of chronic nociceptive and nociplastic pain in an Indian outpatient setting. A clear shift from polypharmacy to simplified, mechanism-based monotherapy — particularly gabapentinoids — was observed over the treatment course. The majority of patients experienced clinically significant pain relief and improvement in quality of life, with high adherence and minimal severe adverse effects. These findings reinforce the need for mechanism-based prescribing tailored to pain subtype and suggest that structured follow-up, patient education, and continuous assessment of drug safety are essential to optimize treatment outcomes. Further multicentric studies with longer follow-up and biomarker-based pain classification may strengthen the evidence base for chronic pain management strategies in resource-limited settings.

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Abbreviations

ADR: Adverse Drug Reaction
NLEM: National List of Essential Medicines
NSAID: Nonsteroidal Anti-inflammatory Drug
OPD: Outpatient Department
PMR: Physical Medicine and Rehabilitation
QoL: Quality of Life
TCA: Tricyclic Antidepressant
VAS: Visual Analogue Scale
WHO-UMC: World Health Organization – Uppsala Monitoring Centre

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