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ORIGINAL ARTICLE

Prescription and consumption of solid oral drugs dispensed as unitary doses in a third level hospital



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Abstract *Background:* The knowledge about the pattern of prescription and consumption of solid oral drugs dispensed as unitary doses (UD) in Mexico is sparing. *Purpose:* The aim of this study was to describe the pattern of prescription and consumption of solid oral drugs dispensed as unitary doses (UD) in a third level private hospital of Mexico. A retrospective study of a 60-month period (from 2007 to 2011) was carried out to know the pattern of drugs dispensed as UD in a third level hospital. *Results:* Among the principal drugs consumed were analgesic, antihypertensive, antibiotic, anti-inflammatory, antiepileptic, and diuretics. The dispensation of drugs per year was as follows: 181 drugs with 85,167 UD in 2007; 199 with 90,519 UD in 2008; 193 with 101,479 UD in 2009; 195 with 100,798 UD in 2010; and 198 with 103,913 UD in 2011. *Conclusion:* The findings confirmed that prescription and consumption of unitary doses in the hospitalization service increased, and revealed the extensive use of analgesics as the principal prescribed drug in this kind of hospital.

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1. Introduction

The dispensation of drugs as oral unitary doses is a scientifically designed and tested system that improves the safety of the patient and therapeutic quality in hospitals (Juárez Olguín et al., 2004; Montojo, 2001). In each stage of the process, an independent evaluation to substantially reduce errors was carried out. The careful preparation and complete identification of unitary doses (drugs, doses, lot, pharmacological activities, expiration date, bar code, and patient's name) in the process of drug use contributes in reducing adverse events related with accurate use of the drug (Blasco et al., 2001; Calderón et al., 2012).

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Table 1 Unitary doses of oral single medicaments prescribed and consumed in a Mexican Hospital from 2007 to 2011.

Generic name	Pharmacological activity	Period (years)				
		2007	2008	2009	2010	2011
Acetylsalicylic acid 100mg	Antiagregant	1231	99	236	186	2387
Acetylsalicylic acid 500mg	Analgesic	155	1561	2153	2440	110
Nalidixic acid/Fenazopiridin 500/50mg	Analgesic/antibacterial	526	491	657	637	407
Valproic acid 250mg	Anticonvulsant	123	78			
Acenocumarin 4mg	Anticoagulant	540	485	561	552	497
Aciclovir 200mg	Antitherapeutic	137	25	50	25	110
Aciclovir 400mg	Antitherapeutic	294	162	239	140	105
Folic acid 5mg	Folate deficiency	196	125	155	50	277
Albendazol 200mg	Antiparasitic	16	48	84	44	98
Alfuzosin	Benign prostatic hyperplasia				14	38
Aloglutamol	Antiacid		58	33	100	70
Alopurinol 100mg	Antigout	116	224	208	301	120
Alopurinol 300mg	Antigout	233		179	270	150
Ambroxol 30mg	Mucolitic		50	125	40	70
Ambroxol	Mucolitic			7	18	
Amiodarone 200mg	Antiarrhythmic			846	1106	779
Amlodipine 5mg	Antihypertensive	981	925	803	1374	1553
Amoxicillin 500mg	Antibiotic	44				
Amoxicillin/clavulanic acid 500mg	Antibiotic	132	85	200	150	90
Amoxicillin/clavulanic acid 875mg	Antibiotic	119	196	162	219	139
Ampicillin 250mg	Antibiotic		11			
Atenolol 50mg	Antihypertensive	397	445	660	768	776
Atenolol/Chlorthalidon 50/12.5mg	Antihypertensive/diuretic	54	28	28	28	56
Atorvastatin 10mg	Hypocholesterolemic	408	483	754	534	359
Atorvastatin 80mg	Hypocholesterolemic				358	990
Azathioprine	Immunoregulator		25	172	94	74
Benzonata 100mg	Antitusive	233	397	378	368	472
Biperidine 2mg	Antiparkinson	90	148	117	94	150
Pinaverium bromide 100mg	Antispasmodic	259	301	150	162	84
Bumetanide	Diuretic	112	299	316	269	200
Butilhyoscine	Antispasmodic	326	255	495	458	535
Butilhyoscine/Metamizole	Antispasmodic/analgesic	430	593	500	372	468
Cabergoline	Lactation suppression		7	44	63	52
Candesartan 8mg	Antihypertensive	204	304	344	297	292
Captopril 25mg	Antihypertensive	1322	1552	1852	2139	1821
Carbamacepine 200mg	Anticonvulsant	350	355	21	188	291
Carbamacepine LC 200mg	Anticonvulsant			350	120	60
Calcium carbonate 500mg	Antiacid		119	111	71	69
Carvedilol 25mg	Vasodilator	56	145	154	122	56
Cephalexin 500mg	Antibiotic	1502	2109	1614	1866	1565
Caffeine/Ergotamine	Antimigraine	202	239	571	72	
Cetirizine 10mg	Antihistaminic	127	133	149	311	288
Cetirizine/pseudoephedrine 5/120mg	Antihistaminic	45				
Celecoxib 200mg	Osteoarthritic				190	275
Cinitapride 1mg	Gastrokinetic	1204	835	2022	1369	1153
Ciprofloxacin 250mg	Antibiotic	175	174	203	60	96
Ciprofloxacin 500mg	Antibiotic	981	1220	1162	986	991
Cisapride 10mg	Gastrokinetic	174	199	234	180	300
Cisapride 5mg	Gastrokinetic	258	174	337	120	30
Clarithromycine 250mg	Antibiotic macrolide	69	103	78	85	177
Clarithromycine HP 500mg	Antibiotic macrolide	213	261	146	83	84
Clarithromycine OD. 500mg	Antibiotic macrolide	48	38	42	85	312
Clindamycine 300mg	Antibiotic	306	129			
Lysine clonixinate 125mg	Analgesic	321	452	614	795	1085
Lysine clonixinate 250mg	Analgesic	234	472	603	844	736
Lysine clonixinate/Pargeverine 125/10mg	Analgesic/antispasmodic		44			635
Clopidogrel 75mg	Plaquetary antiagregant	1266	1680	2141	2240	2098
Chlorphenamine 25mg	Antihistaminic	174	255	186	80	140
Chloropyramine 25mg	Antihistaminic	141	167	177	180	140
Dicycloverine 10mg	Antiflatulency	263	150	168	90	90
Diclofenac 46.5mg	Anti-inflammatory/analgesic	76	127	116	72	72

Table 1 (continued)

Generic name	Pharmacological activity	Period (years)				
		2007	2008	2009	2010	2011
Diclofenac 50mg	Anti-inflammatory/analgesic		439	793	185	90
Diclofenac sodium 100mg	Anti-inflammatory/analgesic	148	228	64	89	59
Diphenidol 25mg	Antiemetic	205	299	248	285	325
Digoxin 0.25mg	Cardiac insufficiency	420	358	600	420	360
Diltiazem 180mg	Antihypertensive		135	372	360	390
Diltiazem 30mg	Antihypertensive	292	379	173	174	270
Diltiazem 60mg	Antihypertensive	252	102	170	190	176
Diltiazem 90mg	Antihypertensive	119	117	16	20	10
Domperidone 10mg	Gastrokinetic/antiemetic	602	702	421	506	626
Doxycycline 100mg	Antibiotic	31	111	94	90	194
Duloxetine 30mg	Antidepressant		42	188	277	311
Enalapril 10mg	Antihypertensive	293	222	274	90	120
Enalapril 5mg	Antihypertensive	136	79	90	360	300
Eplerenone	Antiarrhythmic					214
Ergometrine 0.2mg	Uterus contraction stimulator	275	238	272	239	307
Ergometrine/Caffeine	Antimigraine	135	117	114	120	120
Spironolactone 100mg	Diuretic/antihypertensive	462	450	244	240	419
Spironolactone 25mg	Diuretic/antihypertensive	300	236	388	300	320
Etoricoxib 120mg	Osteoarthritic	644	925	450	266	224
Etoricoxib 90mg	Osteoarthritic	1198	807	854	690	696
Phenazopyridine 100mg	Antibiotic	408	341	415	369	432
Phenytoin 100mg	Anticonvulsant	1120	1358	1434	1084	1091
Flavoxate 200mg	Urinary antispasmodic	408	292	106	120	120
Fluconazole 100mg	Antifungic	309	58	602	40	80
Fluconazole 50mg	Antifungic	60	370	118	367	258
Fluconazole 20mg	Antifungic	130	38	105	28	89
Furosemide 20mg	Diuretic	615	697	841	423	576
Furosemide/spironolactone 20/50mg	Diuretic/antihypertensive	180	192	124	160	112
Gabapentin 300mg	Anticonvulsant		238			
Gabapentin 400mg	Anticonvulsant	465	39			
Gatifloxacin 400mg	Antibiotic	52				
Glibenclamide 5mg	Hipoglicemiant	160	50	349	50	100
Glimepiride 2mg	Hipoglicemiant	234	129	149	130	60
Hydralazine 10mg	Antihypertensive	203	282	435	400	206
Hydralazine 50mg	Antihypertensive	156	96	196	100	100
Hydrochlorothiazide/losartan 50/12.5mg	Antihypertensive/diuretic	75	57	60	75	
Hydrotalcite 500mg	Antiacid		14			
Iron and vitamins 600mg	Antianemic	104	68	144	144	108
Ibuprofen 200mg	Anti-inflammatory/antirheumatic	30	10	263	180	402
Ibuprofen 400mg (Motrin®)	Anti-inflammatory/antirheumatic	342	310	478	450	270
Ibuprofen 400mg	Anti-inflammatory/antirheumatic	63	53	10	17	10
Ibuprofen 400mg	Anti-inflammatory/antirheumatic	125				30
Ibuprofen 600mg	Anti-inflammatory/antirheumatic	126	338			
Indometacin 25mg	Anti-inflammatory/antirheumatic	158	60	114	120	267
Indometacin 50mg	Anti-inflammatory/antirheumatic		30	84	80	
Irbesartan 150mg	Antihypertensive	251	239	582	461	354
Isosorbide 20mg	Coronary vasodilator	115	88	118	150	120
Isosorbide 5mg	Coronary vasodilator			108	20	
Isosorbide 60mg	Coronary vasodilator	38	91	80	40	119
Ketoprofen 100mg	Anti-inflammatory	802	1089	1550	1694	1788
Ketoprofen 200mg	Anti-inflammatory	1069	1289	1141	680	501
Ketorolac 10mg	Analgesic	9562	9792	9342	9296	5805
Ketorolac R 10mg	Analgesic	7786	9535	9296	7627	2192
Ketorolac GI	Analgesic			1398	892	4579
Ketorolac 30mg	Analgesic	166				
Ketorolac 30mg	Analgesic	616	1505	1055	3766	5989
Ketorolac/tramadol 10/25mg	Analgesic					105
Lamotrigin	Anticonvulsant		97	262	235	42
Lansoprazol 30mg	Antiacid	40	21	35	21	7
Levetiracetam 500mg	Anticonvulsant	198	270	364	121	323
Levodopa/Carbidopa 250/25mg	Antiparkinson	200	244	150	150	150

(continued on next page)

Table 1 (continued)

Generic name	Pharmacological activity	Period (years)				
		2007	2008	2009	2010	2011
Levofloxacin 500mg	Antibiotic	555	615	1037	679	689
Levofloxacin T 500mg	Antibiotic	62	55	110	63	91
Levosulpiride 25mg	Prokinetic/antiemetic		105	408	622	161
Levothyroxine sodium 100µg	Thyroid hormone	240	794	719	572	700
Lisinopril 5mg	Antihypertensive		20	51	30	137
Lisinopril 10mg	Antihypertensive	127	185	179	104	
Loperamide 2mg	Antidiarrheic	611	883	605	841	636
Loperamide 2mg	Antidiarrheic	95	140	56	149	340
Loratadine 10mg	Antihistaminic	141	80	231	160	285
Loratadine/pseudoephedrine	Antihistaminic	146	74	15		
Losartan 50mg	Antihypertensive	369	276	342	234	268
Mecicine/Piridoxine	Antiemetic	102	97	116	153	175
Meloxicam 15mg	Anti-inflammatory	134	89	98	68	30
Meclizine 7.5mg	Anti-inflammatory	80	74	90	55	85
Mesalazine 250mg	Anti-inflammatory	394	237	298	141	240
Metamizol sodium	Analgesic/antipyretic	628	524	555	710	710
Metamizol sodium	Analgesic/antipyretic	903	858	1023	1660	3641
Metformin 500mg	Antihyperglycemic				232	392
Metformin/Glibenclamide 500/2.5mg	Hypoglycemic	167	173	305	87	75
Metformin/Glibenclamide 500/5mg	Hypoglycemic	352	144	128	172	72
Methyldopa 250mg	Antihypertensive	97	330	528	171	250
Methylergometrine 0.2mg	Oxytocic		26	70	30	
Metoclopramide 10mg	Prokinetic	4060	4209	4455	4126	4371
Metoprolol 100mg	Antihypertensive	140	165	226	415	354
Metoprolol 95mg	Antihypertensive	469	400	560	673	479
Metoprolol/Hydrochlorothiazide 95/12.5mg	Antihypertensive	47		71		50
Metronidazol 250mg	Amebicide	507	50	111	90	91
Metronidazol 500mg	Amebicide	58	422	464	329	449
Misoprostol 200mg	Antiulcer	182	166			
Moxifloxacin 200mg	Antibiotic	31	61	66	116	125
Naproxen 250mg	Anti-inflammatory/antirheumatic	1268	677	939	655	720
Naproxen/Paracetamol 275/300mg	Analgesic/antipyretic	130	111	90	205	120
Neomycin 250mg	Antibiotic	702	1069	914	593	379
Nifedipine 10mg	Antihypertensive	390	420	1348	432	445
Nimesulide 100mg	Anti-inflammatory/analgesic	568	630	754	909	912
Nimodipine 30mg	Neural calcium antagonist	758	1009	697	779	1124
Nitrofurantoin 50mg	Urinary antibiotic	174	249	353	121	240
Ofloxacin 200mg	Antibiotic	141	108	19	55	60
Ofloxacin 400mg	Antibiotic	50	20	66		36
Olanzapine 10mg	Antipsychotic	76	59	312	140	168
Olanzapine 5mg	Antipsychotic	186	162	79	103	111
Omeprazol 10mg	Antiulcer	306	341	377	311	518
Ondansetron 8mg	Antiemetic	185	161	181	160	189
Oxcarbazepine 300mg	Anticonvulsant	268	274	203	222	180
Oxybutynin 2mg	Urinary incontinence	110	85		60	60
Pancreatin/Dimethicone	Digestive	256	593	728	352	350
Pantoprazol 20mg	Antiulcer	291	204	263	265	138
Pantoprazol 40mg	Antiulcer	859	1111	1026	1585	1261
Paracetamol 500mg	Analgesic/antipyretic	2928	2592	2905	4505	4836
Paracetamol 750mg	Analgesic/antipyretic	5097	1117	720	3788	6078
Paracetamol/Orphenadrine 450/35mg	Antiallergic	152	143	150	100	
Paracetamol/Pseudoephedrine/Chlorphenamine	Analgesic/antipyretic/antihistaminic	40		63		
Paramethasone/Chlorphenamine	Antiallergic		25		50	25
Paroxetine 20mg	Antidepressive	139	97	47	107	40
Pentoxifylline 300mg	Hemorheologic		167	594	180	178
Pioglitazone 15mg	Hypoglycemic	124	95	74	14	21
Pyridostigmine 60mg	Parasympathetic-mimetic	101	73	368	60	98
Prasugrel	Plaquetary antiaggregant					42
Prazosine 1mg	Antihypertensive	90	86	90	211	267
Prazosine 2mg	Antihypertensive	217	366		90	401
Prednisone 20mg	Anti-inflammatory/antirheumatic	490	474	1013	750	630

Table 1 (continued)

Generic name	Pharmacological activity	Period (years)				
		2007	2008	2009	2010	2011
Prednisone 50mg	Anti-inflammatory/antirheumatic	289	313	728	510	550
Prednisone 5mg	Anti-inflammatory/antirheumatic	593	439	408	254	368
Pregabalin 7mg	Anticonvulsant	282	1176	901	1420	1076
Propafenone 150mg	Antiarrhythmic	463	375	836	448	331
Propranolol 10mg	Antihypertensive	765	856	1001	823	672
Quinfamide 500mg	Amebicide					10
Rabeprazol 20mg	Antiulcer	341	250	98	70	62
Racecadotril 100mg	Antidiarreal		103	663	674	832
Ramipril 2.5mg	Antihypertensive	216	418	465	335	240
Ranitidine 150mg	Antiulcer	944	738	563	390	360
Ranitidine A 150mg	Antiulcer	1933	3696	2441	2574	3012
Rifampicin 300mg	Antibiotic	187	141	118	208	77
Rifampicin/Isoniazide 150/75/400mg	Antituberculosis	37	108	24		48
Rosuvastatin 20mg	Lipid-lowering	118	282	300	240	236
Saccharomyces Boulardii	Intestinal flora	120	243	460	289	470
Sennosides A,B 187mg	Laxative	462	732	529	870	660
Sennosides A,B 374mg	Laxative	317	278	294	421	436
Simvastatine 40mg	Cholesterol lowering	10				
Tamsulosin 0.2mg	Benign prostatic hyperplasia				107	352
Tegaserod 6mg	Analgesic	197	149	171	120	136
Tenoxicam 20mg	Anti-inflammatory	28	17			
Theophylline 100mg	Bronchodilator	136	78	261	58	151
Thiamine 300mg	Vitamin	239	130	154	118	208
Tizanidine 2mg	Muscle relaxant	377	406	636	489	410
Topiramate 25mg	Anticonvulsant	304	277	269	252	140
Tramadol 100mg	Analgesic	231	194	255	318	232
Tramadol/Ketorolac	Analgesic			93	235	197
Tramadol/Paracetamol 37.5/325mg	Analgesic/antipyretic	512	593	813	844	1036
Trimebutine 200mg	Prokinetic	182	182	507	812	866
Trimethoprim/Sulfamethoxazole	Bacteriostatic	188	34	99	83	134
Valproate magnesium 400mg	Anticonvulsant	82	8	24	27	10
Verapamil 40mg	Antihypertensive	80	127	38	55	90
Verapamil 4mg	Antihypertensive		94	220	50	60
	Total	85,167	90,519	101,479	100,798	103,913

Drugs constitute primordial base in the treatment of hospitalized patients and their incorrect use could give rise to grievous consequences on the integrity and improvement of the patients (Delgado Silveira et al., 2012). Studies on pharmacoepidemiology permit the knowledge of prescription and consumption patterns of oral unitary dose drugs and this could contribute to drug acquisition programs by medical institutions, optimum storage conditions, and avoidance of the same being out of stock (Calderón et al., 2012; Sicras-Mainar et al., 2009). For these reasons, the objective of this study was to describe the pattern of prescription and consumption of solid oral drugs dispensed as unitary doses (UD) in a third level private hospital in Mexico.

2. Methods

A retrospective study of the consumption of solid oral drugs dispensed as unitary doses (UD) in a third level private hospital in Mexico which attends patients in almost all kind of medical areas was carried out.

For adequateness of prescribed drugs by medical staff, the unitary doses dispensation system of Medical Packaging Inc. with software WinPak 4.0JU was used. The database was built

compiling information from the registers using a 60-month daily logbook prepared from January 1st, 2007 to December 31st, 2011. The information collected was organized taking into consideration therapeutic activity, the patent name of the drug, and monthly consumption of individualized drug dosification with their different brand names or pharmaceutical presentations. This study has been granted an exemption from requiring ethics approval, fortify by Committee of Investigation of this Institution.

3. Results

Table 1 shows the unitary doses orally consumed in the hospitalization service of a third level private hospital in Mexico. The total number of drugs dispensed as unitary doses was as follows: In 2007, 85,167 doses from a total of 181 different drugs dispensed were consumed; in 2008, it was 90,519 doses from 199 different drugs; In 2009, 101,479 doses were administered from 193 different drugs; and in 2010, 100,798 doses were consumed from 195 different drugs while in 2011, it was 103,913 unitary doses from 198 drugs.

Fig. 1 shows drug consumptions from 2007 to 2011 based on their therapeutic activities. There were more than 50

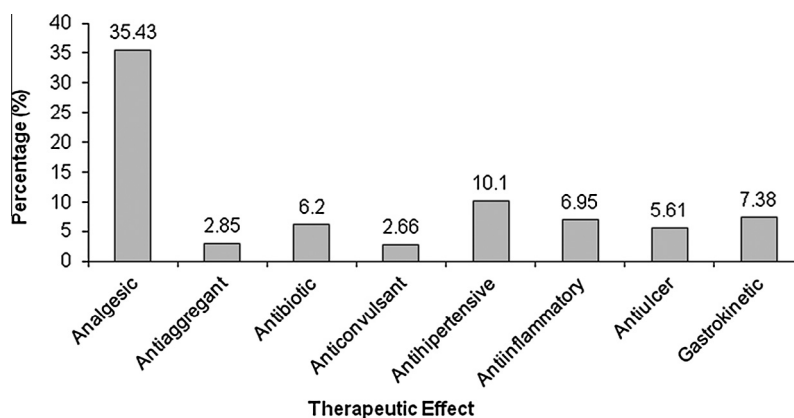


Figure 1 Drug consumption pattern by its therapeutic class from 2007 to 2011.

different therapeutic groups assigned and the groups with values greater than 2% were chosen and these represent more than 77% of the total unitary doses.

4. Discussion

The use of unitary dose drugs is increasing. Is it because more drugs are available in unitary doses or is it because the knowledge among hospital staff about medication safety has increased (Juárez-Olguín et al., 2007). The use of unitary dose system is intended to optimize the consumption of drugs by the hospitalized patients as well as to help the hospitals to make efficient use of their resources (Flores Pérez et al., 2013). This system established that the norms and procedures not only nationals but also internationals have to be followed with the objective of guaranteeing quality results in benefit of the patients and in fulfillment of therapeutic profiles.

It is important to mention that these drug presentations have variations because some of them have been discontinued by the producer laboratories or that innovative drugs for the same purpose have been introduced resulting in the use of repeated generic names but obviously different brand names and chosen by the adscript physician of the hospital.

The registry of drugs consumed in unitary doses in the hospitalization area demonstrates that a great effort and well-trained staff is required to avoid errors in dispensation and medication as well as in possible adverse effects. On knowing the enormous quantity of drugs consumed, it could be suggested that drugs belonging to the following groups: Analgesics (35.43%), Antiagregant (2.85%), Antibiotics (6.20%), Anticonvulsants (2.66%), Antihypertensives (10.10%), anti-inflammatory (6.95%), Antiulcers (5.61%) and Gastrokinetics (7.38%), represented more than 77% of the total drugs consumed.

With respect to the consumption of analgesics, this result agrees with the studies of Sicras et al., who suggested that oral analgesics (paracetamol, tramadol, and aceclofenac) were the most consumed by hospitalized patients. However, in this study, the principal drug consumed was ketorolac.

Studies carried out by Pombo et al. (2007), suggest that ciprofloxacin should be considered as drug of election for integrating antibiotic consumption program in unitary doses and with the present study, it is demonstrated that with the

exception of cephalexin which occupied the first place, this antibiotic was second in place in antibiotic consumption in hospitalization services.

5. Conclusions

The findings confirmed an increase in prescription and consumption of unitary doses in the hospitalization service, and revealed the extensive use of analgesics as the principal prescribed drug in this kind of hospital. The use of unitary dose drugs is increasing in Latino-American countries. Is it because more drugs are available in unitary doses or is it because the knowledge among hospital staff about medication safety has increased.

Consent

The present study was classified as retrospective and epidemiologic, where the Consent and ethical approval is not strictly necessary.

Author contribution

DCG and HJO have made substantial contributions to conception and design of study and have been involved in drafting the manuscript, revising it critically for important intellectual content.

EHG, AMA and BJT have made substantial contributions to acquisition, analysis and interpretation of data.

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