



Medicines for Local Therapy of Wounds in the Ukrainian Pharmaceutical Market

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ABSTRACT

The present study conducted marketing research of the Ukrainian pharmaceutical market in the context of analysis of the assortment policy and sale of medicines for the treatment of wounds and wound infections, including as a result of gunshot wounds. The authors used modern research methods: marketing analysis, expert evaluation, graphical method - to objectively evaluate the qualitative and quantitative indicators of the situation of a particular market segment. As a result of expert evaluation of leading experts, it was found that antibiotics are among the leaders in the appointments of doctors from the main groups and make 83.59% of appointments. In the retail segment, antiseptics and disinfectants, NSAIDs and anti-inflammatory drugs, antibiotics (primarily β -lactates), topical painkillers, antihistamines, and infusion therapies have the largest share (before cash segment sales in 2018). Approximately 20% of the drugs are found to be purchased from local and state budgets, the rest are sold through the retail network. In the hospital segment, antibiotics and antiseptics are the leaders, solutions for infusions are more common, and specific anesthesia and opioid analgesics are specific groups.

Key Words: marketing research, sales dynamics, wounds, manufacturing countries, fire inflammation

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INTRODUCTION

Injuries to the extremities by modern types of firearms are manifold, extensive destruction of soft tissues and bones are often damage to the major vessels and nerve trunks, as well as tearing of segments of limbs [1, 2]. The presence of crushed tissues, freely lying bone fragments, blood clots, and soft tissues in the wound, creates favorable conditions for the development of wound infection [3-6].

RESEARCH MATERIALS AND METHODS

Marketing research is aimed to study the structure of prescription medicine, determining the groups of drugs used in the treatment of a defined range of wounds. As well as a treatment policy analysis and sales of drugs used in the treatment of wounds, including as a result of

gunshot wounds.

This study examined the appointment of surgeons, traumatologists, and anesthesiologists as specialists, who help the largest number of these patients.

RESULTS AND DISCUSSION

The analysis of the appointment lists showed that 688 medicines were assigned for the period 2014-2019. In 2015, 186 medicines were assigned, and in 2019 - 166 medicines commercial names. The list of drugs most commonly found in appointments listed in Table. 1 [7, 8].

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Table 1: List of medicines commonly found in medical prescriptions

№	The name of the medicines in the prescription sheets		
	2015 y.	2019 y.	2014 – 2019 y.
1	Ceftriaxone	Cifran	Ceftriaxone
2	Dexalgin	Sodium chloride	Betadine
3	Cifran	Ketanov	Dexalgine
4	Diclofenac	Betadine	Cifran
5	Betadine	Flamidez	Ketorol
6	Ketanov	Methyluracil with miramistine	Sodium chloride
7	Aksef	Ketonal	Ketanov
8	Sodium chloride	Novocaine	Serrata
9	Chlorophilip t	Dexalgine	Keiver
10	Ketorol	Ceftriaxone	Levomekol
11	Nimid	Chlorgexidene	Movinaza
12	Ranostop	Keiver	Nurofen
13	Lorakson	Ciprinol	Aqua for injection
14	Magnesium sulfate	Levomicol	Ketonad
15	Amsaf	Depiofen	Chlorhexidine
16	Dekasan	Taigeron	Ciprinol
17	Lidocaine	Lidocaine	Ciprolet
18	Tirozur	Dicloberl	Flamidez
19	Doksibene	Oflocaine	Nimesil
20	Dioksizol	Ciprofloxacin	Amsaf
21	Metrogyl	Serrata	Dimexide
22	Serrata	Diclack	Ciprofloxacin
23	Doxicicline	Aqua for injection	Taigeron
24	Solcoserile	Nurofen	Lidocaine
25	Diakarb	Ketorol	Ranostope
26	Flamidez	Liracson	Novocaine
27	Cetalgin	Brecsine	Dicloberl
28	Tiocetam	Decasane	Diclack
29	Zocsane	DECSpro	Nimid
30	Glucose	Avinopone	Fastum

Table 1 shows that among the most popular medicines, among medicines are antibiotics (especially cephalosporins and fluoroquinolones groups), non-steroidal anti-inflammatory medicines (NSAIDs (diclofenac, ketorolac, nimesulide)), antiseptics (chlorhexidine), agents for infusion therapy (atnukozid, Novocaine, lidocaine) are the popular trade names of medicines have changed during the period under review [9].

The structure of assignments by anatomical-therapeutic (ATC) codes of level 1 are given in the Table 2.

Table 2: Assignments structure by ATC of level 1

№	ATC codes of level 1	Number of assignments,%
1	J general antiinfectives for systemic use	22,58%
2	D dermatological	18,41%
3	M musculo-skeletal system	17,88%
4	N nervous system	14,00%
5	B blood and blood-forming organs	10,73%
6	An alimentary tract and metabolism	6,36%
7	R respiratory system	4,68%
8	C cardiovascular system	4,00%
9	V various	0,93%
10	S sensory organs	0,33%
11	G genitourinary system and sex hormones	0,08%
12	H systemic hormonal preparations, excl. Sex hormones	0,02%

The results of this study showed that most often prescribe medicines from the 5 major groups (J, D, M, N, B) are 83.59% of appointments, are the leaders of antibiotics [10].

The assignments structure for ATC 2-level codes is given in Table 3.

Table 3: Assignments Structure by ATC of level 2

№	ATC of level 2	Number of assignments,%
1	2	3
1	J01 antibacterials for systemic use	22,53%
2	D08 antiseptics and disinfectants	15,18%
3	M01 antiinflammatory and antirheumatic products	13,23%
4	N02 analgesics	9,31%
5	B05 blood substitutes and perfusion solutions	7,80%
6	M02 topical products for joint and muscular pain	5,88%
7	R06 antihistamines for systemic use	4,22%
8	C05 vasoprotectives	2,70%
9	N01 anesthetics	2,39%
10	A02 drugs for acid related disorders	3,05%
11	B01 antithrombotic agents	1,36%
12	A07 antidiarrheals, intestinal antiinflammatory/antiinfective agents	1,03%
13	D03 preparations for the treatment of wounds and ulcers	1,74%
14	J02 antimycotics for systemic use	1,47%
15	V07 all other non-therapeutic products	0,98%
16	C04 peripheral vasodilators	0,57%
17	A16 other alimentary tract and metabolism products	0,37%

18	A03 medicines for functional gastrointestinal disorders	0,60%
19	R02 throat preparations	0,39%
20	A12 mineral supplements	0,42%
21	D06 antibiotics and chemotherapeutics for dermatological use	0,44%
22	M09 other drugs for disorders of the musculoskeletal system	0,47%
23	N06 psychoanaleptics	0,27%
24	R05 cough and cold preparations	0,39%
25	S01 ophthalmologicals	0,26%
26	A06 medicines for constipation	0,33%
27	B02 antihemorrhagics	0,23%
28	A14 anabolic agents for systemic use	0,20%
29	N07 other nervous system medicines	0,20%
30	A11 vitamins	0,39%
31	A01 stomatological preparations	0,62%
32	D04 antipruritics, incl. Antihistamines, anesthetics, etc.	0,18%
33	D07 corticosteroids, dermatological preparations	0,15%
34	N05 psycholeptics	0,14%
35	C01 cardiac therapy	0,15%
36	V06 general nutrients	0,08%
37	G01 gynecological antiinfectives and antiseptics	0,09%
38	R01 nasal preparations	0,12%
39	S03 ophthalmological and otological preparations	0,05%
40	H02 corticosteroids for systemic use	0,03%
41	J07 vaccines	0,00%
42	V04 diagnostic agents	0,02%
43	D10 anti-acne preparations	0,00%
44	D11 other dermatological preparations	-

At the 2 levels of the ATC classification, more than half of appointments are occupied by 3 groups of medicines - antibiotics, antiseptics, and analgesics. Therefore, for the investigated specialties of physicians, the primary task is to stabilize the patient, eliminate pain, and prevent wound infection.

At the 3 levels of ATC classification, medicines from 65 classification groups are used (Table 4).

Table 4: Assignment structure for ATC codes at 3 levels

№	ATC codes at 3 levels	Number of assignments, %
1	D08a antiseptics and disinfectants	16%
2	M01a antiinflammatory and	16%

	antirheumatic products, non-steroids	
3	J01d other beta-lactam antibacterials	10%
4	N02b other analgesics and antipyretics	10%
5	M02a topical products for joint and muscular pain	7%
6	R06a antihistamines for systemic use	4%
7	B05b i.v. solutions	4%
8	A02b medicines for the treatment of peptic ulcer and gastro-oesophageal reflux disease	3%
9	C05c capillary stabilizing agents	3%
10	J01f macrolides, lincosamides, and streptogramins	2%
11	D03a cicatrizants	2%
12	J01x other antibacterials	2%
13	J01c beta-lactam antibacterials, penicillins	2%
14	J01m quinolone antibacterials	2%
15	N01b anesthetics, local	2%
16	J02a antimycotics for systemic use	2%

Medicines are purchased at the patients' own expense (pharmacy retail sales) and from the state and local budgets (hospital sales). The retail segment is over 80% in cash.

In the retail segment, antiseptics and disinfectants, NSAIDs, and anti-inflammatory medicines, antibiotics (primarily β -lactates), topical painkillers, antihistamines, and infusion therapy solutions account for the largest share (before cash segment sales in 2018).

Antibiotics and antiseptics also lead in the hospital segment, infusion solutions, and specific anesthesia and opioid analgesics are the most common (Table 5).

Table 5: The structure of prescriptions medicines by ATC codes 3 levels of hospital segment

№	ATC codes of 3 levels	Number of assignments, %
1	J01d other beta-lactam antibacterials	27%
2	B05b i.v. solutions	19%
3	D08a antiseptics and disinfectants	11%
4	N02b other analgesics and antipyretics	5%
5	N01b anesthetics, local	4%
6	J01x other antibacterials	4%
7	M01a antiinflammatory and antirheumatic products, non-steroids	3%
8	R06a antihistamines for systemic use	3%
9	J01m quinolone antibacterials	3%
10	B05x i.v. solution additives	3%

11	A02b medicines for the treatment of peptic ulcer and gastro-oesophageal reflux disease	2%
12	N02a opioids	2%

In the next phase of research, we analyzed the retail pharmacy sales of medicines used in the treatment of exposed wounds, including as a result of gunshot wounds. Table. 6 shows the TOP 30 of 128 medicines with International Non-proprietary Names (INN) according to the appointments of surgeons, traumatologists, and anesthetists (for 2018) [8, 10].

Table 6: TOP 30 medicines for INN

№	ATC codes of 3 levels	Number of assignments, %
1	Metamizolum natriicum	10,00%
2	Ceftriaxonum	8,37%
3	Hydrogenii peroxidum*	6,20%
4	Diclofenacum	6,19%
5	Ibuprofenum	4,83%
6	Omeprazolom	3,32%
7	Iodum*	3,06%
8	Benzocainum+mentholum*+procainum	2,94%
9	Nimesulidum	2,48%
10	Chlorhexidinum	2,40%
11	Azithromycinum	2,18%
12	Loratadinum	2,09%
13	Ketorolacum	1,74%
14	Dextrosom*	1,68%
15	Fluconazolom	1,66%
16	Spiritus aethylicus*	1,63%
17	Methyluracilum*+chloramphenicolum	1,43%

18	Metronidazolom	1,42%
19	Diphenhydraminum	1,40%
20	Acidum acetylsalicylicum*	1,38%
21	Lidocainum	1,38%
22	Viride nitens*	1,30%
23	Meloxicamum	1,23%
24	Amoxicillinum	1,13%
25	Aqua pro injectionibus*	1,02%
26	Levofloxacinum	0,99%
27	Dexketoprofenum	0,99%
28	Amoxicillinum+acidum clavulanicum	0,97%
29	Magnesii sulfas*	0,92%
30	Ciprofloxacinum	0,87%

It has been proven that in the analysis of pharmacy sales, the above-mentioned medicines are used in addition to the the treatment of open and gunshot wounds. However, as well as the structure of medical prescriptions, it is shown that antibiotics (beta-lactams, fluoroquinolones, and macrolides), antiseptics (hydrogen peroxide, solution of brilliant green, iodine, chlorhexidine), NSAIDs (diclofenac, ibuprofen, ibuprofen, mediproxen, ibuprofen, ibuprofen, ibuprofen), anesthetics (lidocaine, novocaine) and so on.

Dynamics Analysis of sales of the top 30 medicines (Fig. 1) by INN (in the packs) shows a tendency to reduce metamizole sales and the growth of ibuprofen and nimesulide. The sales dynamics of Diclofenac remain unchanged.

Among the antiseptic group, sales of hydrogen peroxide remained unchanged, while at the same time sales of green diamond and iodine have decreased. Among antibiotics, increased cephalosporins position and some extent macrolides have lost the selling position of penicillins [5].



Figure 1: Sales Dynamics charts of the top 30 INN in packages

As of December 2019, domestic medicines account for more than two-thirds of sales (in packs) in the analyzed segment (Fig. 2).

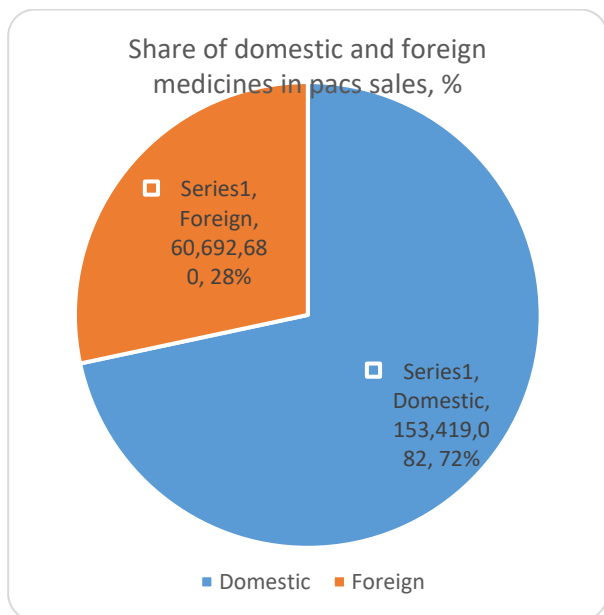


Figure 2: Particle diagram of domestic and imported drugs in the unitary enterprise

By 2014, imported medicines were increasing packaging sales. After the crisis of the 2014 and the rapid increase of the hryvnia exchange rate, their sales in packaging have

declined somewhat, only in recent years the upward trend has resumed (Fig. 3).

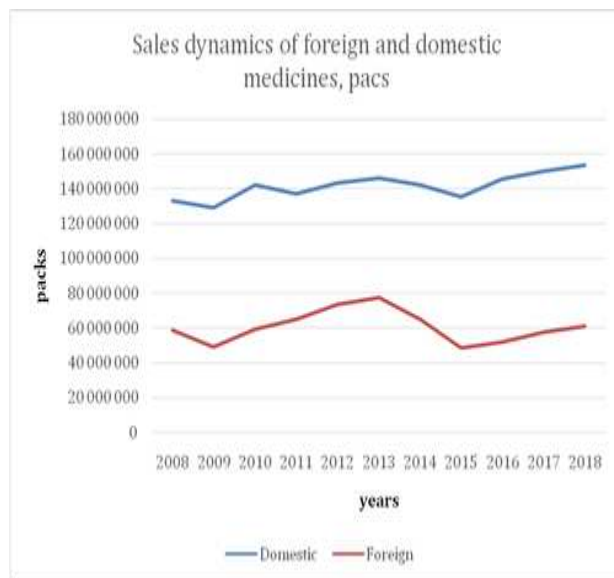


Figure 3: Dynamics charts of sales of domestic and imported drugs in the unitary enterprise

In the segment of agents used to treat open wounds and gunshot wounds from 2008 to 2018 represented 267 manufacturers. Since 2018, only 104 manufacturers had more or less significant sales, with 22 manufacturers providing 85% of the segment's packaging needs (Fig.4).

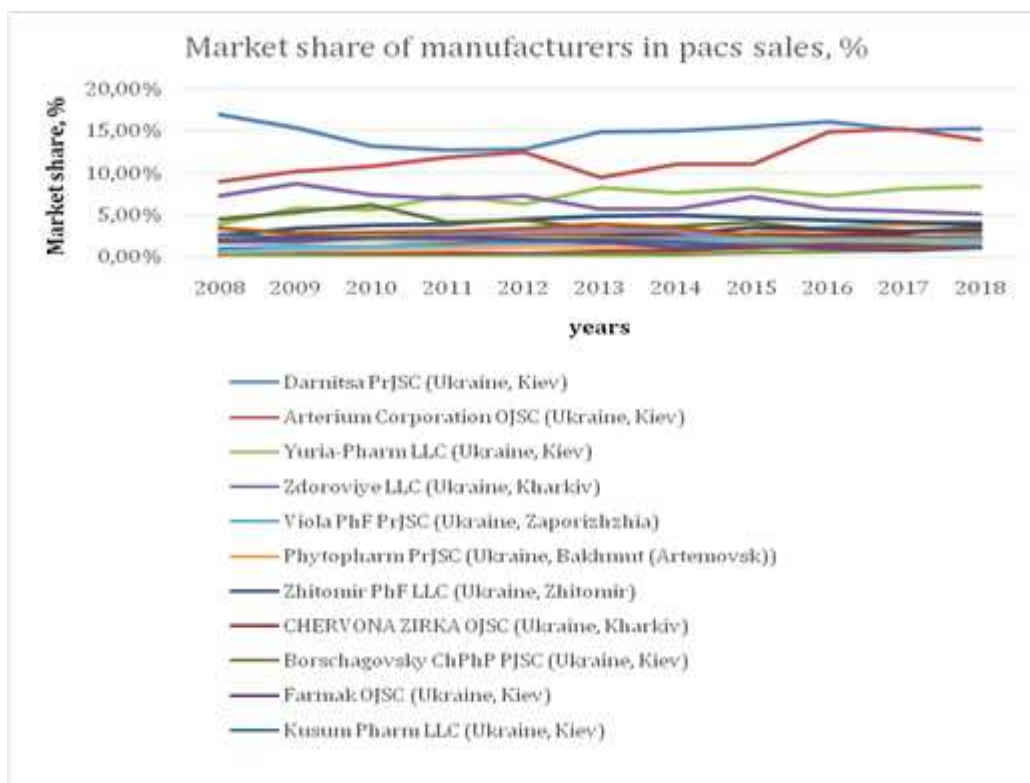


Figure 4: Dynamics diagrams of manufacturers particles in a unitary enterprise

From the analysis of the data, Fig. 4 shows that the top ten are domestic manufacturers, which generally account

for approximately 65% of sales of the studied segment. At the same time, the share of most of them remains

unchanged or increases (Yuriy Pharm, manufacturer of infusion solutions), except PJSC Health (Kharkiv).

Between 2008 and 2019, up to 900 trade names of medicines were used to treat open wounds, including as a result of gunshot wounds. As of Q3 2019, there were 473 active medicines in the active segment.

In the next stage of the study, sales of individual therapeutic groups were analyzed. Yes, antibiotic segment accounts for 15.6% of total sales of the investigated segment. The antibiotic segment includes 142 medicines from different manufacturers and includes cephalosporin agents (1-4 generations), fluoroquinolones (2-3 generations), individual penicillins, and macrolides. Also antimicrobial agents of the imidazole derivatives group are ornidazole and metronidazole. As well as tobramycin and sulfanilamides, lincomycin and doxycycline. Leading positions are taken by ceftriaxone from various manufacturers [3, 4, 10].

CONCLUSION:

It is found that approximately 20% of the medicines are purchased from local and state budgets, the rest are sold through the retail network. Antibiotics have the highest share (primarily, 3rd generation cephalosporins, fluoroquinolones, imidazodine derivatives, etc.), NSAIDs for oral, parenteral, and topical use (ketorolac, diclofenac, ibuprofen, nimesulide, etc.), anesthetics (lidocaine, zirconium, and lidocaine), chlorhexidine, decasan, miramistin), infusion solutions (glucose, isotonic sodium chloride solution, reosorbilact, Ringer's solution, etc.). A certain proportion (even in the retail segment) is occupied by anesthesia, opioid analgesics, anticoagulants, proton pump inhibitors, parenteral nutrition, serratiopeptidase, actovegin, and solcoseryl, calcium, as well as a number of topical antibiotics, wound healing products.

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