Fast-Track Approach for Breast Reconstructive Surgery in Patients With Breast Cancer

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ABSTRACT

AIM: The aim of this study was to develop and implement the concept of fast-track surgery (FTS) for reconstructive breast surgery in patients with breast cancer (BC) to improve early and long-term results of treatment.

MATERIALS AND METHODS: The study includes 749 patients with stage 1 to 3 BC. A total of 253 patients with BC got treatment according to FTS program and were included to the core group. Other 496 patients with BC (control group) were not included to the FTS program. Patients were treated from December 2010 to December 2014. All age groups were covered (18-70 years old).

RESULTS: There was a significant difference in the average length of hospital stay (LOS) which was 14.27 ± 7.00 days in the core group and 20.11 ± 7.70 days in the control group ($P < .001$). In advanced BC cases in the core group, LOS was >8 days lower comparing with the control group on average. The LOS in patients who underwent adjuvant chemotherapy was 2.7 times lower in the FTS group comparing with the control group.

CONCLUSIONS: The study results allow us to recommend the concept of FTS for implementation in broad medical practice for breast reconstructive surgery in patients with BC. The FTS program was shown to be effective in all types of breast surgery, including immediate oncoplastic and reconstructive surgeries. The gradual reduction of LOS increased the number of surgeries in our department by 75% from 2008 till 2018.

KEYWORDS: Fast-track surgery, breast cancer, reconstructive surgery.

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Introduction

Comparing with standard breast cancer (BC) surgical treatment, immediate oncoplastic and reconstructive surgeries in patients with BC are increasing the risk of postoperative complications and the length of hospital stay (LOS), delaying the start of adjuvant chemotherapy (ACh). The indicated problems were important arguments in favor of delayed reconstructive operations for most surgeons. The solution to these problems was development and implementation of the concept of fast-track surgery (FTS).

Fast-track surgery, also known as "enhanced recovery after surgery" (ERAS), was pioneered by Henrik Kehlet, a Danish colorectal surgeon. It is an evidence-based multimodal approach to limit surgical trauma burden, relief pain, and ensure early recovery without complications.[1] The FTS program covers the issues of perioperative care, features of the surgical technique, and postoperative period in patients undergoing surgical treatment. The FTS is based on pathophysiological principles that allowed us to reduce stress arising from surgery, pain relief, early mobilization, and commencement of early oral nutrition.[2]

The FTS program was initially used for patients with gastrointestinal tumors and was not widely introduced in patients with BC in early 2010s.

The aim of our study was to develop and implement the concept of FTS for reconstructive breast surgery in patients with BC to improve early and long-term results of treatment.

Materials and Methods

The study is conducted according to the ethics principles of Helsinki Declaration, GCP (Good Clinical Practice), and Law of Ukraine "On medications" approved by the Commission on issues of ethics of the National Cancer Institute (Protocol No. 7 of April 8, 2010) and the Commission on issues of ethics of the Bogomolets National Medical University (Protocol No. 71 of April 10, 2013). All patients were informed about the research and signed the agreement.

The study included 749 patients with BC T1-4 N0-3 M0 of all age groups (18-70 years old) who received specialized treatment (according to the Order of the Ministry of Health "On approval of medical treatment protocols on the specialty "Oncology" #554 since September 17, 2007, onwards "National Protocol of Ukraine since 2007," and Local Protocol of National Cancer Institute) at the Department of Breast Tumors and Reconstructive Surgery of the National Cancer Institute, Oncology Department, Bogomolets National Medical University, from December 2010 to December 2014 within an

open noncommercial randomized controlled clinical trial. Randomization was performed with an unequal randomization method. Patients were divided into 2 groups: core group and control group. The core group patients were treated using FTS program, whereas the control group patients had standard approach. The observation time was 10 years. Inclusion criteria for patients were women aged between 18 and 70 years old, stage T1-4 N0-3 M0 of BC, state by ECOG score 0 to 2, signed agreement to take part at the research, and ability to follow all the statements of the agreement. Exclusion criterion for patients was having severe comorbidities (⩾3 stage heart failure, chronic renal failure, liver failure, acute infectious diseases). Dropout rate was 0. The outcomes of 2 groups were compared by the length of stay in the hospital and level of complications. The core group consisted of 253 patients with BC, and the control group had 496 BC.

The core group patients were managed according to the following FTS protocol:

1. Prior to surgery:
   - Providing full information and education to patients concerning their stay at the hospital and surgical treatment;
   - Shaving;
   - Compressive bandaging of lower extremities;
   - Avoid food 6 hours and drinks 3 hours prior surgery;
   - Urinary catheterization if the surgery time is planned to be more than 2 hours.
2. During surgery:
   - Antibiotics;
   - Analgesics;
   - Antiemetics;
   - Anticoagulation in selected cases;
3. After surgery:
   - 37°C heating of flaps with thermal blankets;
   - Postsurgery compressive bra;
   - Early activation of patients 3 hours after surgery;
   - Breathing exercises;
   - Water drinking 2 hours after surgery;
   - Light food 6 hours after surgery;
   - Aseptic wound dressing for 10 days (dressing change only if necessary);
   - Surgical wound draining until there is less than 50 mL of exudate, straw in color;
   - In selected cases, drug administration (antibiotics/analgesics/antiemetics/anticoagulation if necessary).

The standard data model was created in EXEL and in the analytical data models SAS 9.4 and STATISTICA. All calculations and graphs were made in SAS 9.4 and STATISTICA applications.

The FTS program for patients with BC at the preoperative stage involves conducting psychological training for the patient and explanation of the aims of all manipulations. In the case of planning of the autologous breast reconstruction, Doppler ultrasound examination of the graft is required. We should clarify the type and adequacy of the blood flow.

Surgery is conducted by 2 teams to decrease the duration of operation. Antibiotic prophylaxis is done before surgery. Minimization of surgical trauma occurs by performing cuts in the minimal blood supply areas and using the electrocautery with a minimal coagulation level. Special mashes are used to prevent abdominal wall defects in case of TRAM-flap breast reconstruction. Adsorbing suture material, adequate mobilization of the graft (without tension), and removal of tension from the edges of the wound are obligatory in autologous breast reconstruction.

The postoperative period involves an early activation of the patient (3-4 hours after the operation), immediate removal of the urinary catheter after the activation of the patient, oral administration of antibiotics, using of nonnarcotic analgesics, and using low-vacuum drainage systems.

We recommend wearing a compression bra after the operation, keep warm the patient and the graft at a constant temperature (37°C) after the operation and during the first day. Low-molecular-weight heparins and helium-based heparins are prescribed for improvement in microcirculation on the next day. Performing sonographic monitoring of postoperative wound and stimulation of peristalsis during TRAM-reconstruction and refusal from parenteral administration of solutions at enteral use of at least 600 mL of fluid are required.[3-6]

Results

The effectiveness of FTS concept was analyzed among 749 patients in the general population. The sample consisted of 253 patients in the core group, of which in 92 (36.4%) cases mastectomy with 1-stage reconstruction with autologous tissues was performed, in 87 (34.4%) cases, mastectomy with 1-stage reconstruction with alomaterials (silicone implants) was performed, and in 74 (29, 2%) patients oncoplastic breast-conserving surgery of second to third level by Krishna Clough was performed. Among 496 patients in the control group, 3 (0.6%) cases mastectomy with 1-stage reconstruction with autologous tissues was performed; in 78 patients (15.7%), mastectomy with 1-stage reconstruction of alomaterials (silicone implants) was performed. A total of 415 (83.7%) patients underwent mastectomy or breast-conserving surgery.

All cases (100%) in the core group were of the fifth level of surgical difficulty, compared with the control group (16% of the operations of the fifth level of surgical difficulty and 84% of the operations of the fourth level of surgical difficulty). "Conditions" in the core group provided for longer duration of the narcosis, more pronounced pain syndrome, blood loss, parenteral infusion therapy and thromboprophylaxis (low-molecular-weight heparin), LOS, patient care, staying in the intensive care unit, cost of treatment, and, most importantly, delaying of further specialized treatment. Arguments above mostly limited the conduction of immediate reconstructive surgery in patients

Table 1. Descriptive statistics of length of hospital stay of patients in the control group, the core group, and in general.

STATISTICS	LENGTH OF HOSPITAL STAY (LOS), D		
	IN GENERAL, IN 2 GROUPS	CORE GROUP	CONTROL GROUP
Total no. of patients, persons	749	253	496
Average length of hospital stay, d	18.2	14.27	20.12
Medium-square deviation of length of hospital stay, d	8.02	7.00	7.71
Mode, d	15	13	16
Median, d	17	14	19
First quartile, d	13	10	15
Third quartile, d	22	17	24
Quartile scope, d	9	7	9
Coefficient of variation, %	44.1	49.1	38.3
Coefficient of asymmetry	0.62	0.82	0.63
Coefficient of excess	0.48	1.66	0.36

with BC. According to the National Protocol of Ukraine since 2007, reconstructive surgery was recommended to be conducted several years after the completion of the specialized treatment, and mainly plastic surgeons were trying to perform such operations. However, the development and implementation of the FTS program have allowed us to extend the readings in immediate reconstructive operations. So, the difference in 1-stage reconstructive operations between the core and control groups was in 4.3 times higher in the core group comparing with the control group.

Purulent-septic complications occurred in 4 patients (1.5%) in the core group, whereas in the control group, such complications were manifested by local hyperemia in drainage zone and disappeared after wound healing occurred in 25 patients (5.0%). The mean duration of serous excretions was 13.2 ± 2.0 days in the core group and 16.0 ± 3.1 days in the control group ($P > .05$). The average total volume of the exudate in the core and control groups was 501.0 ± 7.3 and 508 ± 10.7 mL, respectively. The necessity for additional aspiration of seroma after removal of drainage originated in 13 patients (5.1%) in the core group. In the control group, this indicator was in 466 patients (94%; $P < .01$). Consequently, 95% of patients in the core group did not need daily dressings and independently maintained a low-volume drainage system, and patients in the control group in 94% of cases needed daily dressings of the wound.

The pain score was based on the visual analog scale of pain. Complaints on severe pain were not seen in any patient. Moderate pain was noted in 17 patients (6.7%) in the core group and in 62 patients (12.5%) in the control group. Opiates were not prescribed in the postoperative period in patients of the core group; in the control group, opiates were prescribed in 57 cases (11.5%) on a period of 1 to 2 days.

According to the National Protocol of Ukraine since 2007, patients should have had in-patient treatment until recovery of working capacity, making median of 14 days.

The effectiveness of the FTS program is based on the analysis of the LOS. Among 253 patients, the average LOS was 14.27 ± 7.00 days in the core group, whereas for 496 patients, it was 20.11 ± 7.70 days in the control group (Table 1).

In addition, 25% of patients in the core group were in hospital for less than 10 days and 75% for less than 17 days. At the same time, in the control group, the corresponding indicators are higher than 1.5 times for 25% of patients, up to 15 days, and 1.6 times for 75% of patients, up to 24 days. It should be noted that in Ukraine there is no patronage system, so patients are staying in the hospital before wound healing, which increases the total LOS (days) in comparison with other countries.

As shown in Figure 1, the differences between the control and core groups are very visible. The validity check showed that these discrepancies in the core and control groups with a probability $<.001$ (Figure 1) are not accidental.

The distribution by LOS in the control group is characterized by a large shift toward a shorter stay than in the core group (Figure 2). In addition, in the core group, the concentration of patients around the modal value in 5 times higher.

As the modal interval in the core and control groups is in the range of 10 to 20 days, however, the modal value is 13 days in the core group and 16 days in the control group. The median value is 2 weeks—14 days—in the core group and is almost 3 weeks in the control group. It means that LOS in half of patients is up to 14 days in the core group and for 5 days longer in the control group.

The LOS in the core group, compared with the control group, decreased by 29%, which involved reduction in cost of treatment for the hospital (nursing costs, depreciation of the building and equipment, communal costs and nutrition for patient, etc). That

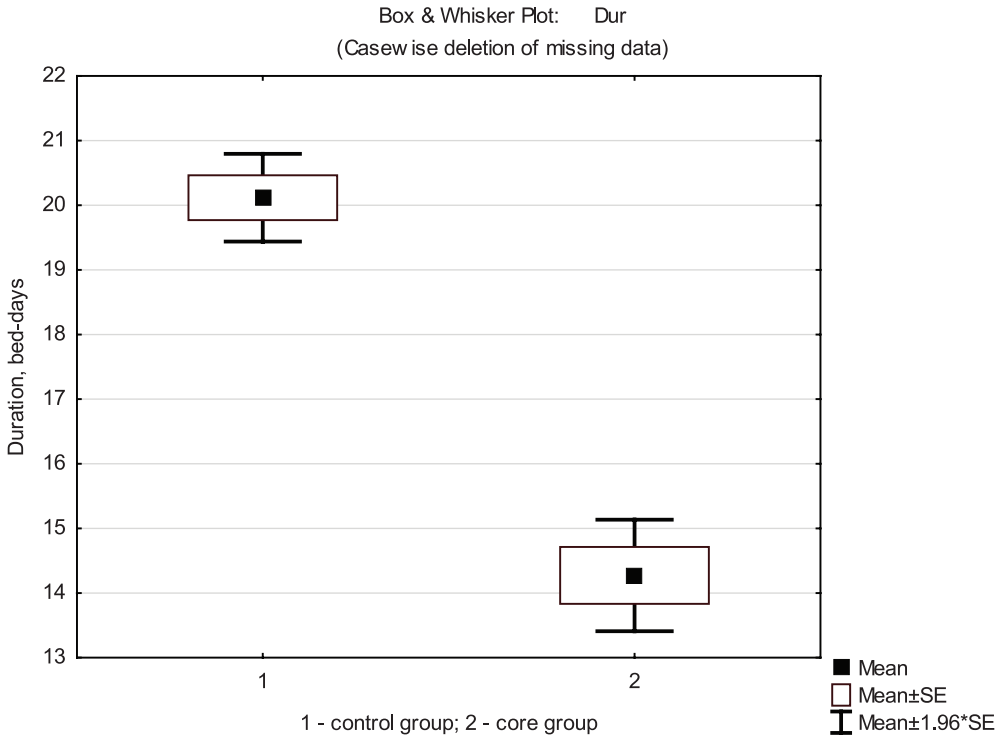

Figure 1. Variation of length of hospital stay (LOS) in the core and control groups, days.

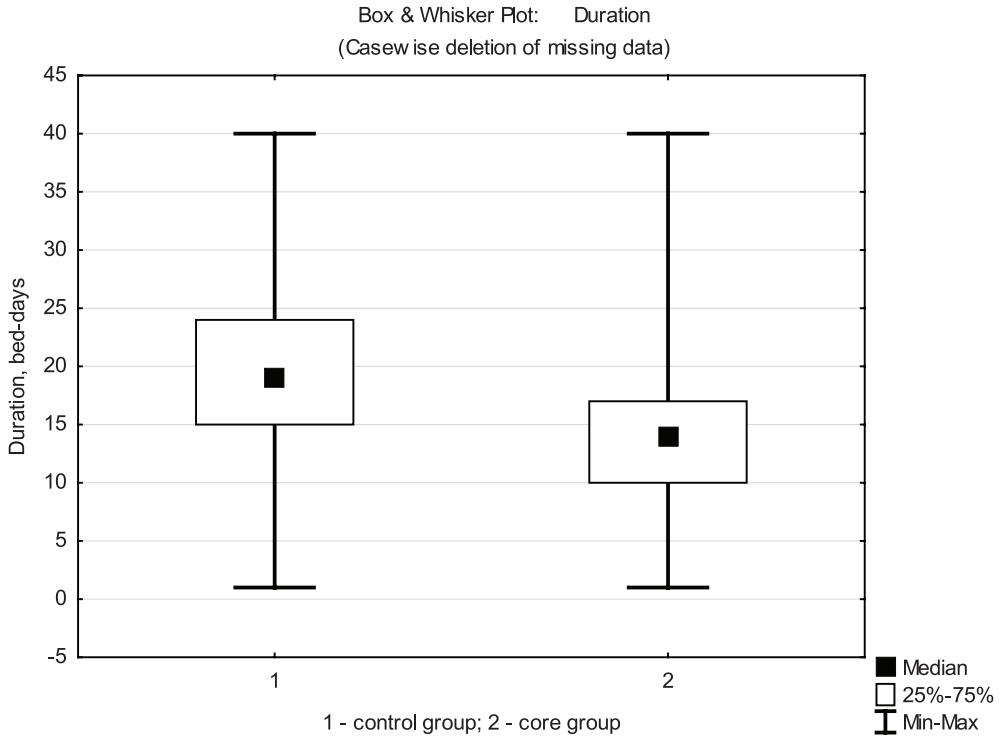

Figure 2. Distribution of patients by length of hospital stay in the core and control groups.

is, if conventionally the cost of stay at the hospital costs 1000 UAH per day, the decrease in price of surgical treatment in the core group is 7000 UAH per patient, giving a total economy of 1.77 million UAH for all patients of the core group comparing with the control group. Also, we have to mention that the decrease in LOS opens the possibility to treat more patients, having the same number of beds in the hospital. Taking into consideration that till 2018 LOS in our department was being decreased and now is up to 5 days for breast reconstructive surgeries and up to 2 days for breast surgeries with no reconstruction, now we have an increase in the number of surgeries in the department (from 680 in 2008 to 1183 in 2018).

Table 2. Average length of hospital stay and 95% confidence interval depending on the stage of the disease, LOS days.

STAGE OF DISEASE	NO. OF PATIENTS	AVERAGE LENGTH OF HOSPITAL STAY (LOS), D	CONFIDENCE INTERVAL (−95%)	CONFIDENCE INTERVAL (+95%)
I	234	16.3	15.3	17.3
IIA	258	17.9	16.9	18.9
IIB	115	20.6	19.1	22.0
IIIA	83	19.7	18.0	21.4
IIIB, IIIC	60	20.3	18.3	22.2

Table 3. Results of the ANOVA model—length of hospital stay in patients depending on the stage of disease in the core and control groups.

STAGE OF DISEASE	NO. OF PATIENTS		AVERAGE LENGTH AND 95% CONFIDENCE INTERVAL OF HOSPITAL STAY, BED-DAYS		DIFFERENCE IN LENGTH OF HOSPITAL STAY BETWEEN C AND CR GROUPS, BED-DAYS
	CR	C	CR	C	
I	93	140	12.9 ± 1.4	18.4 ± 1.2	−5.5
IIA	80	177	14.4 ± 1.5	19.4 ± 1.1	−5.0
IIB	36	79	17.9 ± 2.3	21.8 ± 1.7	−3.9
IIIA	28	55	13.8 ± 2.6	22.7 ± 2.0	−8.9
IIIB, IIIC	16	44	14.1 ± 3.4	22.5 ± 2.3	−8.4
Total	253	496	14.3 ± 1.0	20.1 ± 0.7	−5.8

Abbreviations: C: control group; Cr: core group.

Further analysis of LOS is aimed at assessing the differences between the core and control groups depending on the stage of the disease. Proved with probability <.001, in both groups, the duration of stay in treatment depends on the stage of the disease (Table 2).

However, the core and control groups are not accidentally having fundamental differences in LOS depending on the stage of the disease (Table 3). This is especially true for the third stage, and itself: IIIA, IIIB, IIIC.

As shown in Table 3, the difference in terms of LOS in patients with more common stages of disease in the core group compared with the control group for more than 8 days. Moreover, LOS in patients with third stage in the control group is not only practically the same as that in patients in the second stage of the disease, but even less than the average in summation. In addition, in the core group, there is a clear tendency of increase in LOS with the increase in the stage of the disease, and in the control group there is no such trend.

The study evaluated the influence of ACh on LOS—385 patients (51.4%), who had no ACh, compared with 364 (48.6%) patients, who underwent ACh. The average LOS of patients who underwent ACh was 20.1 days, whereas in patients who had no Ach, it was 16.4 days ($P < .001$). The effect of ACh on LOS in the core and control groups is shown in Table 4.

Analyzing the obtained data, conducting ACh in the core group caused an extension of LOS for 1.4 days, which was statistically insignificant. In the control group, the ACh significantly increased LOS at 3.8 LOS days, which practically does not differ from the total for a value of 3.7 LOS days. Consequently, the conduction of ACh in the core group against the background of FTS did not have a significant negative impact on the increasing of LOS compared with the control group and the general population. Thus, the difference between LOS with ACh and without ACh was 2.7 times lower compared with the control group.

Discussion

The multimodal program "Fast-Track surgery" (FTS) or "Enhanced Recovery After Surgery" (ERAS) or "Ambulatory Breast Cancer Surgery" covers issues of preoperative preparation, features of operational techniques, management of the postoperative period in patients subjected to surgery.[7] The FTS is based on pathophysiological principles that allowed us to reduce stress arising from surgery, pain relief, early mobilization, and commencement of early oral nutrition.[2]

Fast-track surgery pathways are well established and used since 1997 in other surgical specialties but are relatively new in breast oncological, plastic, and reconstructive surgeries. In

Table 4. Length of hospital stay in the core and control groups depending on adjuvant chemotherapy.

GROUP	LENGTH OF HOSPITAL STAY, LOS DAYS		DIFFERENCE, LOS DAYS	SIGNIFICANCE LEVEL
	WITHOUT ACH, D	WITH ACH, D		
Core group n = 253	13.7	15.1	1.4	$P = .116$
Control group n = 496	18.1	21.9	3.8	$P < .001$
Total n = 749	16.4	20.1	3.7	$P < .001$

several studies, fast track was shown to reduce preventable postoperative harm and shorten hospital length of stay in BC surgery and microsurgical breast reconstruction. Fast track was not associated with postoperative complications (partial flap loss, total flap loss, breast hematoma, donor-site infection, urinary tract infection, and pneumonia). Key recommendations support early mobilization after surgery, early feeding, adequate warming up patients during and after surgery, and using minimum drugs to control pain and nausea after surgery.[8-10]

Comparing the data obtained from our research with the world literary data, we noted that FTS is a program that exists for a short time and practically was not used in BC surgery. Therefore, there are only separate messages on the specified subject. For example, Danish researchers indicate a significant difference (1.2 LOS days in the FTS group versus 3.6 LOS days with standard management). A particularly large difference was noted after performing mastectomy (1.6 LOS days in the FTS group versus 5.0 in the control group).[11] In our study, the LOS (days) was reduced from 20.1 in the control group to 14.3 in the FTS group, that is, approximately the same result as in mentioned researchers. The long duration of an LOS (days) in Ukraine was caused due to certain bureaucratic features (prohibition of discharge before receiving a histological conclusion, discharge only without drainage, etc) and it is connected with the absence of patronage service in Ukraine as such.

Another study concerned patients who underwent alloplastic breast reconstruction. In the FTS group, bilateral and immediate reconstruction was performed more often, and implants were installed more often than expanders. In the FTS group, hematoma and infectious complications were somewhat more common, but the difference was not significant. At the same time, the use of FTS made it possible to significantly reduce the LOS (3 times less than in the control group).[12]

The next work concerned 1-sided reconstruction of the breast with own tissues (TRAM and DIEP flaps). Traditional treatment modes and FTS mode were compared. The duration of operations was approximately the same in both groups; however, the average volume of blood loss was less in the FTS group than in the control group (406 mL versus 827 mL). The percentage of complications was about the same in both groups. The main complications were as follows: urological infections (1.4% in control group and 0.6% in the FTS group), postoperative pneumonia (1.0% versus 1.7%), complete flap necrosis (2.4% versus 2.2%), partial flap necrosis (3.0% and 3.6%, respectively), breast infection (3.4% and 1.7%), breast hematoma (6.5% and 7.9%), infection in the donor zone (2.7% versus 2.8%), and hematoma in the donor side (1.4% and 2.2%). Using the FTS program made it possible to reduce the duration of LOS days from 13 to 5 days.[13] This study group published similar data (decrease in duration at 3 days after using FTS) in another edition.[14]

The meta-analysis, which included 260 publications and 1191 cases, revealed a significant advantage of the FTS program compared with the traditional management of patients. According to the percentage of complications, there is no clear correlation between FTS and occurrence of postoperative complications. Alfonso et al., Astsnehe et al., Bonde, and Dumestre et al. indicate fewer complications after using FTS. Both in the FTS group and in the control group, frequent complications were partial or complete necrosis of flaps, or wound edges, bleeding, purulent-septic complications, repeated hospitalization, or reoperation. At the same time, according to the meta-analysis, there is absolutely no correlation between the occurrence of complications and the method of patient management.[15]

The absence of a correlation in the incidence of postoperative complications between traditional and "outpatient" (FTS) management of patients in the population of East Asia is indicated by a group of Singaporean authors.[16] In other words, FTS program does not lead to increase in complications, regardless of the ethnic characteristics of patients.

With reducing the LOS, we decrease the usage of medicines or dressing materials, and, respectively, this gives us a great economic effect. For example, the price for patients who underwent mastectomy with immediate breast reconstruction with free flap was US$38 688 when FTS protocol was used versus US$43 264 when FTS protocol was not used, so FTS made a difference of US$4576.[17] Unfortunately, we do not have the opportunity to adequately calculate the economic effect of using FTS in Ukraine (because of difficult and reforming state of Ukrainian medicine). However, if the cost of staying per day in Ukrainian private clinics is averaged, the decrease (according to our data) in the average LOS by 5.8 days will give us reduction around 5000 to 15 000 UAH saved per patient.

As no data were found on ACh and the LOS, we investigated this problem. It turned out that patients in the FTS group who underwent ACh a week after surgery did not significantly

increase the hospitalization period (13.7 days without ACh and 15.1 days with ACh, $P = .11566$), whereas in the traditional management (with no FTS protocol), a significant increase in LOS was found (18.1 days without ACh versus 21.9 days with ACh, $P < .001$).

Conclusions

The study results allow us to recommend the concept of FTS for implementation in broad medical practice for breast reconstructive surgery in patients with BC. The FTS program was shown to be effective in all types of breast surgery, including immediate oncoplastic and reconstructive surgeries. The gradual reduction in LOS increased the number of surgeries in our department by 75% from 2008 till 2018.

Author Contributions

Igor Motuziuk: idea, design, materials and methods, conclusions.
Oleg Sydorchuk: materials and methods, data processing.
Yevhenii Kostiuchenko: materials and methods, data processing.
Natalia Kovtun: statistics.
Petro Poniatovskyi: design, formalization.

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REFERENCES

1. Kehlet H, Wilmore DW. Evidence-based surgical care and the evolution of fast-track surgery. *Ann Surg*. 2008;248:189-198. doi:10.1097/SLA.0b013e31817f2c1a.
2. Shchepotin IB, Smolanka II, Skliar SIu, et al. Rak hrudnoi zalozy. Suchasni aspekty khirurhichnoho likuvannia (za danymy Natsionalnoho instytutu raku) [in Ukrainian]. *Klinichna Onkolohiia*. 2013;1:38-43.
3. Sydorchuk OI, Motuziuk IM, Zaichuk VV, et al. Metod drenuvannia ran pislia radykalnykh modeliuiuchykh operatsii u khvorykh na rak hrudnoi zalozy [in Ukrainian]. *Onkolohiia*. 2016;18:55-58.
4. Shchepotin IB, Motuziuk IM, Sydorchuk OI, Pap LS, Yehorov IV, Sydorenko KD (Ukraina). Patent na korysnu model 54579 Sposib vedennia khvorykh na rak molochnoi zalozy na etapi khirurhichnoho likuvannia [in Ukrainian]. № 2010 08492; Zaiav. 07.07.2010; Opubl. 10.11.10.Biul. № 21.
5. Motuzyuk I, Sydorchuk O, Kovtun N, Kostiuchenko Y. Synchronous and metachronous breast cancer in Ukraine. *Breast Dis*. 2017;37:83-93. doi:10.3233/BD-170285.
6. Motuzyuk I, Sydorchuk O, Kovtun N, Palian Z, Kostiuchenko Y. Analysis of trends and factors in breast multiple primary malignant neoplasms. *Breast Cancer (Auckl)*. 2018;12:1-9. doi:10.1177/1178223418759959.
7. Hainsworth AJ, Lobo CR, Williams P, et al. "23 h Model" for breast surgery: an early experience. *Breast*. 2013;22:898-901. doi:10.1016/j.breast.2013.04.007.
8. Sebai ME, Siotos C, Payne R, et al. Enhanced recovery after surgery pathway for microsurgical breast reconstruction: a systematic review and meta-analysis. *Plast Reconstr Surg*. 2019; 143 (3): 655-666. doi:10.1097/PRS.0000000000005300.
9. Temple-Oberle C, Shea-Budgell M, Tan M, et al. Consensus review of optimal perioperative care in breast reconstruction: enhanced recovery after surgery (ERAS) society recommendations. *Plast Reconstr Surg*. 2017;139:1056e-1071e. doi:10.1097/PRS.0000000000003242.
10. Stone JP, Siotos C, Sarmiento S, et al. Implementing our microsurgical breast reconstruction enhanced recovery after surgery pathway: consensus obstacles and recommendations. *Plast Reconstr Surg Glob Open*. 2019;7:e1855. doi:10.1097/GOX.0000000000001855.
11. Mertz BG, Kroman N, Williams H, Kehlet H. Fast-track surgery for breast cancer is possible. *Dan Med J*. 2013;60:A4615.
12. Dumestre DO, Redwood J, Webb CE, Temple-Oberle C. Enhanced recovery after surgery (ERAS) protocol enables safe same-day discharge after alloplastic breast reconstruction. *PlastSurg (Oakv)*. 2017;25:249-254. doi:10.1177/2292550317728036.
13. Bonde C, Khorasani H, Eriksen K, Wolthers M, Kehlet H, Elberg J. Introducing the fast track surgery principles can reduce length of stay after autologous breast reconstruction using free flaps: a case control study. *J Plast Surg Hand Surg*. 2015;49:367-371. doi:10.3109/2000656X.2015.1062387.
14. Bonde CT, Khorasani H, Elberg J, Kehlet H. Perioperative optimization of autologous breast reconstruction. *Plast Reconstr Surg*. 2016;137:411-414. doi:10.1097/01.prs.0000475749.40838.85.
15. Offodile AC 2nd, Gu C, Boukovalas S, et al. Enhanced recovery after surgery (ERAS) pathways in breast reconstruction: systematic review and meta-analysis of the literature. *Breast Cancer Res Treat*. 2019;173:65-77. doi:10.1007/s10549-018-018-4991-8.
16. Ng YY, Chan PM, Chen JJ, Seah MD, Teo C, Tan EY. Adopting ambulatory breast cancer surgery as the standard of care in an Asian population. *Int J Breast Cancer*. 2014;2014:672743. doi:10.1155/2014/672743.
17. Oh C, Moriarty J, Borah BJ, et al. Cost analysis of enhanced recovery after surgery in microvascular breast reconstruction. *J Plast Reconstr Aesthet Surg*. 2018;71:819-826. doi:10.1016/j.bjps.2018.02.018.