A New Era in Operating Rooms with Artificial Intelligence:

AI-POWERED SURGICAL ASSISTANT SOLUTION

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CHALLENGES WE FACE

01

Manual documentation	>	Time loss, higher risk of errors, surgeons' attention diverted from the procedure
Lack of real-time decision support	>	No systematic support at critical moments
Insufficient integration	>	Disconnected HIS, PACS, EHR and devices
Language & procedure	>	Misalignment in multinational and multi-specialty teams

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CURRENT METHODS AND **THEIR LIMITATIONS**

02

Manual note-taking & reporting	›	Time-consuming, high risk of errors
Limited voice command systems	›	Only basic device control, no contextual awareness
Passive use of video data	›	Recording exists, but no contribution to analytics, reporting, or training
Common problem	⋮	Lack of real-time and contextual Support

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KPIs WE AIM TO IMPROVE

03

Operational efficiency ↗	Documentation time is reduced
Error rate ↘	Critical risks are minimized
Time management ↗	Reporting becomes faster
Surgical quality & consistency ↗	More standardized and reliable outcomes
Patient safety & satisfaction ↗	Higher perceived quality and sense of trust

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DEVELOPMENT OF **THE SOLUTION**

04

AI-powered surgical assistant	Developed by in-house teams
Surgeons & OR staff	Actively involved in the development process
AI models	Trained specifically for different procedures
Data security & regulatory compliance	Treated as a top priority during development
Result	A user-centric solution that is both technically robust and clinically aligned

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AI TECHNOLOGIES USED

Voice models	Transcription aligned with medical terminology
Vision models	Detection of critical moments from camera feeds
Large Language Models (LLMs)	Summarization, reporting, and documentation support
Integrated system	A digital assistant working alongside the surgeon

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DATA SOURCES AND **TRAINING PROCESS**

06

Audio data	Open-source, cleaned, and manually transcribed
Text data	Textbooks, academic articles, and scientific literature
Image/video data	Academic + synthetic datasets
Training duration	1–15 days (depending on the model)
Model performance	Evaluated using dedicated test sets & medical exam (TUS) questions

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TECHNICAL CHALLENGES WE FACED

Data quality	Noise & echo mitigated with advanced signal processing
Terminology alignment	Re-trained with domain-specific data
Real-time performance	GPU/CPU optimization, quantization, pruning
Data security	GDPR & HIPAA-compliant anonymization implemented
Hallucination issue	Reduced through prompt engineering

PILOT STUDIES & **PREPARATION PHASE**

Pilot infrastructure	Completed; preparations for clinical phase are ongoing
Ethics approval	Process is in its final stage
Collaboration	Pilot deployment planned with Akdeniz University
First steps	Clinical data access, ethics approval, controlled tests

CONTRIBUTIONS **ACHIEVED**

Innovation culture	Strengthened within the company
Data-driven mindset	Extended to other projects
R&D processes	Adopted a more clinically focused approach
Regulatory alignment	Increased awareness of data security and compliance

SCALING & APPLICATION AREAS

Surgical specialties	Easily adaptable to different branches
Multilingual capability	Ready for international use
Beyond the OR	Post-op workflows, robotic surgery, medical education
New integration domains	HIS, PACS, IoT devices, patient monitoring systems
Academic use	Valuable data source for clinical research

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VALUE ADDED TO **THE INDUSTRY**

Decision support	>	Systems are standardized
Reporting	>	Manual workflows replaced by automated processes
Patient safety	>	Critical errors prevented through proactive alerts
Multilingual use	>	Procedure-independent, scalable globally
Clinical improvement	>	Insights from surgical data drive quality & performance gains

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IMPLEMENTATION PROCESS

Pilot deployments	Limited case testing across different specialties
Validation	Tested in real surgical environments
Optimization	System refined using user feedback

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INTEGRATION **PLANS**

Surgery management	API integration with existing hospital systems
Device data	Real-time processing of camera and audio device streams
Patient records	Automatic addition of structured reports into information systems
Hardware infrastructure	Smooth processing of high-volume data
Support for surgeons	Real-time digital assistant during operations

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SUSTAINABLE **IMPACT**

Economic impact	Higher efficiency, reduced costs, fewer re-operations
Social impact	Increased patient trust, reduced administrative burden, higher job satisfaction
Environmental impact	Paperless workflows enable energy and resource savings

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1–3 YEAR **VISION**

Widespread adoption	Deployment in university hospitals & private healthcare groups
Specialty-based models	AI models tailored to different surgical domains
Deep integration	Alignment with HIS, PACS, and robotic surgery platforms
Decision support	More advanced and proactive mechanisms
Beyond the OR	Expansion into post-op follow-up, clinical reporting, and medical education

INTERNATIONALIZATION

Target markets	Expansion into Europe, the Middle East, and North America
Compliance	Architecture aligned with GDPR & HIPAA standards
Strategic partnerships	Collaborations and investment initiatives
Global vision	Becoming a strong and sustainable player in the global healthcare ecosystem

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