NATO STANDARD

AMedP-5.3

DEVELOPMENT AND IMPLEMENTATION OF TELEMEDICINE SYSTEMS

Edition A Version 1

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NORTH ATLANTIC TREATY ORGANIZATION

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NORTH ATLANTIC TREATY ORGANIZATION (NATO)

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NATO LETTER OF PROMULGATION

23 November 2018

1. The enclosed Allied Medical Publication AMedP-5.3, Edition A, Version 1, DEVELOPMENT AND IMPLEMENTATION OF TELEMEDICINE SYSTEMS, which has been approved by the nations in the Military Committee Medical Standardization Board, is promulgated herewith. The agreement of nations to use this publication is recorded in STANAG 2517.

2. AMedP-5.3 Edition A, Version 1, is effective upon receipt and supersedes AMedP-37, Edition A, which shall be destroyed in accordance with the local procedure for the destruction of documents.

4. This publication shall be handled in accordance with C-M(2002)60.

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Brigadier General, HUNAF
Director, NATO Standardization Office

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RECORD OF RESERVATIONS

CHAPTER	RECORD OF RESERVATION BY NATIONS
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RECORD OF SPECIFIC RESERVATIONS

[nation]	[detail of reservation]
CZE	CZE does not fully dispose of integrated Electronic Health Record required in AMedP-5.3(A) Version 1, Annex A.
NLD	Ratifying and implementing within restrictions of European Privacy Law and regulations.
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CHAPTER 1 INTRODUCTION

1.1. AIM AND DEFINITION

Aim. The aim of the NATO COMEDS Health Information Systems and Technology Working Group (HISTWG) in providing this document is to set out guidance as well as Standards for nations wishing to develop national Telemedicine capabilities, which can be integrated into NATO forces.

Definition. Telemedicine is 'the practice of medicine over a distance using information and communication technologies[1]'.

1.2. SCOPE AND BENEFITS

1.2.1 Scope

Within the scope of Telemedicine the requirements can be divided into 5 main areas:

a. Organisation of the experts (medical, technical and administrative).

b. User Access Devices[2] (UAD) and Medical Data Capture Devices[3].

c. Minimum framework requirements for technical communications and other infrastructure to enable the transfer of data.

d. Applications/software to support and enhance medical outcomes.

e. Information management of the data generated during Telemedicine activities.

A Telemedicine capability requires solutions in all 5 of the above areas to ensure the delivery of a coherent capability. The interoperability of Telemedicine capabilities is necessary to ensure quality and continuity for a patient moving through a multi-national care pathway with communications from the point of care to the gaining medical facility.

1.2.2. Benefits

It is recommended to monitor and evaluate benefits arising from the use of Telemedicine by collecting data which can be used to further improve the capability and demonstrate value for money. However, it is critical that Operational benefits to combat forces are demonstrated so that the resource commitments are justified, fully understood, and agreed by the controlling stakeholders. The potential benefits[4] include:

[1] NATO Term.
[2] Such as laptops, tablets and smart phones.
[3] For example microscopes.
[4] Adapted from the US Institute for Healthcare Improvement's 'Triple Aim'.

a. **Improved health outcomes.** Telemedicine contributes to the health of service members and other entitled personnel by improving the accessibility, timeliness, and/or comprehensiveness of healthcare delivery, which in turn improves health outcomes. The level and standard of medical expertise within the deployed combat space can be increased with rapid diagnosis and treatment. Telemedicine capabilities may contribute to the generation of new knowledge via research practices (e.g. trauma registries and disease surveillance).

b. **Improved military readiness.** Service members may return to duty more quickly when Telemedicine capabilities are used. This applies both within the operational theatre and when used to reach out to service members in their bases or homes.

c. **Improved use of resources.** Telemedicine can create efficiencies: the need for patient evacuation may be mitigated or avoided; scarce, high-value, difficult to recruit healthcare providers can utilise their expertise in previously inaccessible areas; lost productivity of both healthcare providers and service members may be avoided or reduced; the logistical and personnel footprint in the operational theatre may be reduced; and costs may be reduced.

d. **Improved experience of care.** Telemedicine may provide care experiences which are more culturally[5]/socially effective, timely, convenient, and comprehensive.

1.3. BACKGROUND

Whilst Telemedicine is not new[6], technological advances and greater accessibility to technology have created a plethora of opportunity that could have utility to support healthcare, to improve service delivery and patient outcomes. The term Telemedicine has a broad scope encompassing capabilities from a simple telephone conversation to remote robotic surgery. Noting that there are many definitions, the World Health Organisation[7] describes Telemedicine as:

> 'The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of healthcare providers, all in the interests of advancing the health of individuals and communities.

[5] For example accommodating a gender constraint for some patient populations by providing a chaperone by VTC.
[6] An early example of Telemedicine was the use of telephone wire to transmit electrocardiograph data and recorded by W Einthoven (Le telecardiogramme [The telecardiogram]. Archives Internationales de Physiologie, 1906, pp. 132-164
[7] WHO, Telemedicine: opportunities and developments in Member States: report on the second global survey on eHealth 2009, p. 9.

with four key elements:

a. To provide clinical support, including supervision in a timely manner.

b. To overcome geographical barriers, connecting users who are not in the same location.

c. To use a variety of Information & Communications Technology (ICT).

d. To improve health outcomes'.

Telemedicine is a supporting capability[8] for the delivery of clinical care and is not an end in itself. Within the NATO context, Telemedicine is a tool that facilitates the remote sharing of information that includes but is not limited to medical images, data from medical devices, written and verbal exchange of information and the ability to perform clinical evaluations remotely. This capability involves a variety of technologies, including live two-way audio and video modalities e.g., clinical video-teleconferencing (VTC) between patients or healthcare providers at the 'originating site' and medical expert at the 'distant site' and additional emerging technologies. Leveraging global communication, computing power and miniaturisation will extend the reach, utility and economy of medical services, improving service delivery and patient outcomes. It should be noted that:

a. Telemedicine is already utilised by the many NATO nations on a daily basis with proven health and financial benefits although some nations display more widespread adoption of telemedicine than others.

b. The requirement incorporates the use of Telemedicine across the spectrum of healthcare within military medical contexts.

c. Communities of innovation and interest already exist within and across NATO nations.

1.4. OPERATIONAL EMPLOYMENT

The capabilities delivered by Telemedicine will provide an enabling function for military health care both in the home country and in the deployed environment, on national and NATO operations throughout the length of the patient care pathway. Telemedicine can play an increasingly important role with capabilities and procedures benefitting from experimentation and proving on exercises with the NATO Response Force. This is described below:

a. **Maritime**. Telemedicine capabilities are deployed with standing and operational forces at sea, in littoral environments where amphibious operations are required and in extreme environments. Existing routine use of Telemedicine

[8] The Medical Standardization Working Group of the NATO Standardization Office identified the need for, and the benefits of, interoperable Telemedicine support, both within and across national force lines. AJP 4.10.

is enabled through existing ship-to-ship and ship-to-shore communications systems to, access medical specialists as part of a 24/7 service.

b. **Land.** Land forces have the ability to deploy forces across Ground Lines of Communication of varying terrains and possibly considerable distances where Telemedicine utility will be high, but communications will be challenged. The spectrum of operations can range from peace keeping to high intensity war fighting.

c. **Air/Avn.** Air manoeuvre provides a capability that can achieve speed of deployment and redeployment, independent of terrain, and delivery of personnel and equipment or supplies rapidly over distance and onto objectives that would normally be considered inaccessible by vehicles. Telemedicine capabilities need to be operationally compatible both in air transport frames and with dismounted teams. Telemedicine can, in some situations, make for more effective Aeromedical Evacuation (AE) and treatment while in air.

1.4.1. NATO Interoperability

Plugging Telemedicine into trans-national 'sockets' within the NATO modular approach will provide challenges in terms of communications system (both trans-national and across strategic, operational and tactical boundaries), time, cultural and co-ordination. The ability to communicate across national operational boundaries will be key.

1.5. SUMMARY

1.5.1. Planning Guidance

Further planning guidance can be found at Annex A.

1.5.2. Summary

The wider accessibility of communications technology is offering opportunities for medical communications innovation however national and NATO communication and medical initiatives need to consider medical capability requirements and multi-national interoperability when developing communications equipment. Finally, whilst Telemedicine has its place in the medical-military tool-kit, it is a supporting capability for the delivery of clinical care and is not an end in itself.

1.5.3. Further Information

The national representatives to the NATO COMEDS HISTWG can provide the latest information and signposting to further sources and best practice.

ANNEX A TELEMEDICINE PLANNING GUIDANCE AND TECHNICAL STANDARDS

A.1. Aim. The aim of this guidance is to provide a conceptual and practical framework to accelerate the understanding and implementation of Telemedicine capabilities in nations. For conceptual purposes Telemedicine can be defined in the following time-related framework:

a. **Synchronous.** These 'real-time' Telemedicine services involve interactive, electronic communication exchange in at least two directions in the same time period.

b. **Asynchronous.** Also known as 'store and forward', these Telemedicine encounters transmit medical images or information in one direction at a time via electronic communications.

A.2. Capability Users. The users could be:

a. Military medical personnel and first responders.

b. Patients who use military medical services.

c. Civilian healthcare[1] and administrative professionals who support military healthcare delivery.

d. International Organisations or Non-Governmental Organisations[2].

A.3. Stakeholders. For interoperability purposes the key stakeholders are Allied Command Operations, Allied Command Transformation, NATO Communications and Information Agency (NCIA) and the NATO COMEDS HISTWG[3].

REQUIREMENTS

A.4. The first actions for a procurement are normally having a conceptual 'course of action' (COA) endorsed from which the requirements will develop. COAs can be constructed using the suggested minimum functional requirements shown in Appendix 1, which in turn can be divided into 5 areas:

a. **Organisation.** Organisation of the experts (medical, technical and administrative).

[1] Including Governmental Organisations.
[2] For example, the cooperation during the Ebola response and potentially for disaster relief tasks.
[3] The NATO HISTWG's task is to: identify, consolidate and disseminate best practice, identify further capability/capacity gaps and if required, define a national or NATO requirement. A long term Telemedicine (TMed) team has been established within the HISTWG to provide information and guidance.

b. **Equipment.** User Access Devices[4] (UAD) and Medical Data Capture Devices[5].

c. **Communications Infrastructure**. Minimum framework requirements for technical communications and other infrastructure to enable the transfer of data. The availability of video teleconferencing, telephone facilities and the connections to transmit images, data, etc.

d. **Applications.** Applications/software to support and enhance medical outcomes.

e. **Information.** The exchange of information, taking into account cultural and language friction. Information management of the data generated during Telemedicine activities.

ORGANISATION

A.5. Organisation. The first principle for Telemedicine is the organisation of the medical expertise on call to maximise the benefit of the communication, dissemination and utilisation of medical knowledge. The enabler is the co-ordination function which must be resourced, trained and controlled. This capability may be developed within the military or externally procured from one of the existing suppliers. Other organisational considerations are:

a. The scope of the service, whether it is '24/7', real-time, on-call, or scheduled. The procedures for allocating priority whether urgent or routine. How users can gain convenient access to the service and whether they can use their own devices subject to security considerations[6].

b. Provision of a physical or virtual co-ordination hub/ mechanism for rosters, directory of capabilities, contact information, service issues etc.

c. Access to civilian expertise. If the force is deployed in a developed state which has granted permission to access the medical services the need for telemedicine with be different and possibly less than a force deployed in an austere environment with no or little local expertise.

EQUIPMENT

A.6. Telemedicine may employ a wide range of technologies from simple voice communication to real-time media conferencing facilities along with the ability to handle medical specialty-specific data streams (e.g. heart and lung sounds, ECGs, video and still

[4] Such as laptops, tablets and smart phones.
[5] For example microscopes.
[6] This is not an exhaustive list. Please refer to your HIST WG representative for the latest factor analysis.

images) captured with the use of specialized equipment. The rapid development of robust high performance and miniaturized equipment such as handheld computers, small inexpensive high-resolution cameras, miniature satellite telephones and image compression techniques may enable real-time video teleconferencing to forward medical care elements in the future.

A.7. Innovation. Many areas of innovation exist for example wearable sensors, medical devices, mobile applications and physiological monitors which might be exploited to inform command decision making and facilitate clinical decision making.

COMMUNICATIONS INFRASTRUCTURE

A.8. Synchronous vs Asynchronous. Communication may be carried out in real-time[7] or store-and-forward[8]. Oftentimes, delayed communication is adequate or even preferred to allow time for diagnostic input without interruption. Real-time might be used for example in assessing whether a patient should be evacuated or transferred by utilising expert opinion. The interaction may involve a variety of synchronous (i.e., real-time) and asynchronous (i.e., store and forward) technologies, between patients or healthcare providers at the 'originating site' and medical expert at the 'distant site'. By necessity, mobile technologies will be much more prominent in Telemedicine across borders and in operational zones than clinical VTC, so it makes sense to refer more broadly to synchronous capabilities than specifically to clinical VTC.

A.9. Current Systems. Opportunities to exploit current systems; including desk top VTC and telephone based support services. The availability of suitable secure, national and/or NATO approved infrastructure including User Access Devices and application hosting services should be explored with National and NATO J6.

A.10. Connection requirements. Bandwidth requirement will vary depending on the availability or type of connection. Telemedicine capabilities need to be flexible enough organisationally and technically to adjust to these challenges, including the ability to delivery capabilities in a low bandwidth environment. The requirements for bandwidth changes rapidly as products develop so reference should be made to your national representative on the HISTWG for up to date information. As combat intensity increases connection reliability becomes a greater constraint because the priority for bandwidth is likely to be switched to those elements directly taking part or directly supporting the operation.

A.11. Communication Interoperability. Capabilities shall be interoperable and shall utilise standardised communication protocols, a standardised medical vocabulary and data sets within the common reference architecture. The implementation of CP 5A0050/9B0020 'Bi-SC Automated Information System Core Capability' and CP 0A0104 'Communication

[7] Streaming is a method of delivery of real-time or stored data such as audio, video, documents, still images, or other data type across networks. With streaming, a receiving system can start displaying data before the entire content arrives.
[8] Sending, reviewing, and returning an opinion over a period of time

Network Support for the Alliance' by the NATO C3 Agency will facilitate the communication of medical information.

A.12. Future Wide Area Wi-Fi. This may be an enabler for Telemedicine, however Wi-Fi and other broadcast may need to be turned off in tactical arena so robust fall-back plans will be required.

APPLICATIONS

A.13. Procurement. The aim should be to make maximum use of standards-based Commercial Off-The-Shelf (COTS) applications and technology. Products which are COTS rather than bespoke are developed to work within an open technical architecture, so as to promote interoperability. The configuration ability of the COTS products should be explored during the procurement process to confirm suitability for military use, including interoperability. Bespoke products may be considered for medium-term operations or specific niche capabilities.

INFORMATION

A.14. Standards. STANAG 2543 'Standards for Data Interchange between Health Information Systems' provides relevant standards for medical data. Systems must conform to the NATO system and technical architectures specifically NATO Medical Information Management System (MIMS)/Medical Communications and Information System (MEDICS) system and technical architectures which are currently in iterative development within NCIA. Standard data and information exchange protocols will be vital to the implementation of Telemedicine. There is a requirement for all nations to employ internationally-recognized standardized protocols (e.g. ISO TC215 and CEN 251 Medical Informatics standards, HL-7, ISDN , TCP/IP, videoconferencing standards H.320/323, DICOM- 3.0 communication for Teleradiology, HTML/XML for mark-up text/object processing, standard web browser), rather than proprietary or nationally-specific protocols. Interoperability of encryption and security measures for personal medical data (e.g., Public-Private Key Infrastructure - PKI) will be a fundamental prerequisite, and must be considered in the development of any such system.

A.15. Interoperability.

a. **NATO.** The services delivered must be compatible and interoperable with the outputs of NATO MEDICS wherever possible and practical.

b. **Civilian.** Interoperability with civilian medical services may provide additional expertise and capacity.

A.16. Privacy and Security of Medical Data. The privacy and security of individually identifiable health information used and maintained in Telemedicine systems is vital

together with a Patient Safety policy to ensure governance and compliance with national legislation.

OTHER PLANNING FACTORS

A.17. Training. Education, Training, Exercising and Evaluation must be carried out to ensure coherence with the implementation of systems and policy.

A.18. Personnel. The recruitment of specialised staff or assignment of duties will need time to negotiate. A robust fallback plan for absences will be required if using existing staff.

A.19. Risk. As usual a risk assessment must be made with consideration of the risk of treatment delay or the compromise of patient confidentiality, such as use of incorrect e-mail addresses or the lack of appropriate clinical staff, which could lead to patients receiving delayed or sub-optimal care. Other risks such as language friction, signal attenuation and loss, image degradation, and service interruption as well as loss of visual, auditory and other cues normally present in a person-to-person medicine should be considered. Risks can be mitigated through the formulation of policy, robust organisation plus Education, Training, Exercising and Evaluation (EETE).

A.20. Legal. All services, systems and products must meet the requirements of national legislation. Services must be compliant with national and international procurement regulations. Existing agreements will impact any Telemedicine concept, for example Status of Forces Agreements, national legislation, responsibilities, guidance and NATO policy. Where agreements between nations include measures on the provision of health care, consideration should be given to including a section on the provision of health care by Telemedicine.

A.21. Project Practices. Nations should use standard project practices[9] as a guide to set out the business case and project specifications.

A.22. Further Information. Your national representative on the NATO HISTWG can provide examples of current cutting edge developments as well as more mature practices.

Appendices

1. Functional Minimum Requirements

[9] For example; PRINCE2, Managing Successful Programmes and internal business case frameworks. These would include: the identification of their requirements, desirable minimum operational capability statements for each Role of medical care, a business case,: a description of the capability to be provided and the capability deficiency, training and support requirements, a comparison of cost to qualitative or quantitative benefits, and risks of not providing the capability.

FUNCTIONAL MINIMUM REQUIREMENTS

The table below sets out indicative user requirements together with the minimum requirement to achieve NATO interoperability and the current best practice within NATO Nations.

Ser	User Requirement	Justification/ Benefit	Minimum Req	Objective Req
1	The user (patient and clinicians) shall be able to communicate and exchange information when they are not geographically co-located		Asynchronous communication.	Synchronous (real-time) communication.
2	The user shall be able to access telephone services via NATO approved, available infrastructure in all environments at all times.			
3	The user (healthcare professional or patient) shall be able to access Video Teleconferencing services	Enable senior staff to provide support and advice to more junior staff. Enable staff with specialist skills/knowledge to communicate easily with all staff/patients regardless of geographical location (effective use of manpower resources) Improve patient communication	Nil	Able to access from any device including via the internet.
4	The user (healthcare professional) shall be able to access senior or specialist clinical advice to support clinical decision making in all environments at all times.		Asynchronous communication.	Synchronous (real-time) communication.
5	The user shall be able to record the health record data created during Telemedicine activities to enable this information to be added to an integrated Electronic Health Record (iEHR).	To meet statutory and assurance requirements and professional standards	User action required All types of healthcare record data including although not exclusively written, audio, video, images, scans	Automatic data transfer according to business rules The health record data generated during Telemedicine activities is automatically linked to the iEHR

6	The user shall be able to communicate healthcare data from medical devices.	Transfer medical data in a timely and accurate manner. Improve data accuracy by avoiding 'human error' in data transfer Patient safety Ensure user (clinician/medical administration) have access to all data relating to a patient to ensure safe, effective delivery of healthcare Ensure clinician has access to all relevant medical record data to inform clinical decisions	Accuracy of data Integrated to iEHR Time/Date/User recorded (meta data) Placed in location defined by business set rules Acceptable speed of data transfer depends on device and type of data (time frames to be defined by the business on item by item basis)	Completely automated procedure (no action required by user).
7	The user shall be able to communicate digital images.			
8	The user shall be able to access reliable, up-to-date information to support clinical decision making processes via approved, available infrastructure in all operating environments.			The information needs to able immediately available when the user requests it.
9	The user shall be able to exploit all healthcare data captured during Telemedicine activities at all levels from individual to MIS/big data level.	To meet statutory, governance and assurance requirements and professional standards. To meet reporting requirements at all levels from individual patient/clinician to NATO HQ level including for surveillance, epidemiological and Public Health purposes.		Defined, coded, data can be exploited by search, query and reporting tools to ensure the accuracy of results.

AMedP-5.3(A)(1)