



Multimodal highly-sensitive PhotonICs endoscope for improved in-vivo COLON Cancer diagnosis and clinical decision support

<p>Deliverable title</p> <p>Final version for promotional material</p>	Deliverable ID:	D8.13
	Due date:	31-12-2019
	Submission date:	20-12-2019
	Editor/Lead beneficiary (name/partner):	Carlos Reyes/Tyndall
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<p>Abstract:</p> <p>This document represents the Deliverable 8.13 in the framework of the PICCOLO project. The document describes various promotional material that has been generated, including leaflets, presentations, scientific publications and press releases. This is the final version of this deliverable.</p>		
Dissemination level		
PU	Public	X
CO	Confidential, only for members of the consortium and the Commission Services	



This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under grant agreement No 732111

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Documents history

Document version #	Date	Change
V0.1	25/07/2017	Starting version, template
V0.2	25/07/2017	Definition of ToC
V0.3	25/07/2017	First complete draft
V0.4	25/07/2017	Integrated version (send to WP members)
V0.5	25/07/2017	Updated version (send to Quality Manager)
V0.6	25/07/2017	Updated version (QM send to project internal reviewers)
Sign off	25/08/2017	Signed off version (for approval to EB members)
V1.0	25/08/2017	Approved Version to be submitted to H2020 office
V2.0	22/11/2019	Update for second/final version
V2.1	06/12/2019	First complete draft
V2.2	07/12/2019	Updated version (sent to project internal reviewers)
V2.3	19/12/2019	Updated version sent to QM
Sign off	20/12/2019	Signed off version (for approval to EB members)
V2.4	20/12/2019	Approved Version to be submitted to H2020 office

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Executive summary

This document represents the Deliverable D8.13 in the framework of the PICCOLO project, titled “Multimodal highly-sensitive PhotonICs endoscope for improved in-vivo COLOn Cancer diagnosis and clinical decision support” (Project Acronym: PICCOLO; Call: ICT-29-2016: Photonics KET 2016; Topic: H2020-ICT-2016-2017).

It is the final summary of the promotional material for the clinical application of the PICCOLO product and the wide efforts the PICCOLO consortium made on informing the public of the PICCOLO project and its aims. In detail, the dissemination of the project was promoted by leaflets for patients and clinicians, the public informed by a leaflet for conference, online posts on the website and Twitter, conference talks and publications. Therefore, the activities give a wealthy basis for a promotion of the PICCOLO aims and its outcomes for the last six months of the project period.

1. Introduction

1.1 Objective of this document

This document represents the Deliverable D8.13 in the framework of the PICCOLO project, titled “Multimodal highly-sensitive PhotonICs endoscope for improved in-vivo COLOn Cancer diagnosis and clinical decision support” (Project Acronym: PICCOLO; GA 732111).

The document gives a description of leaflets, press releases and other dissemination activities that have been designed to promote the project to the general public, and provide information to patients about what the advantages of the PICCOLO probe will be. This will increase awareness of the project among academic and medical persons, as well as patients who may undergo treatments involving the PICCOLO endoscope probe.

1.2 Structure of this document

This document consists of three sections. The first section is the introduction of the document and its aims, its structure and the relationship with other deliverables of the PICCOLO project. After the introduction, we find the main part of the document, consisting of Section 2 describing the promotional material which is being used to promote the project, followed by a summary of the document in Section 3.

1.3 Relationships with other deliverables

Deliverable D8.13 presented in this document relates on the following deliverables:

- D8.1/D8.10/D8.11/D8.12 “Plan for the Exploitation and Dissemination of Results (PEDR)”. The PEDR is a strategic document for the beneficiaries helping them to establish the bases for their intellectual property strategy, dissemination and exploitation activities.
- D8.2 “Website, templates and social media”. Establishing a presence on the internet that is publicly available.

2. Promotional material

The following sections present current material that exist either in physical form (leaflets), or that have been published on the web (press releases, twitter posts) or on conferences (talks, posters).

2.1 Leaflet for conferences

In order to promote the PICCOLO project at conferences and other events, the leaflet below was designed. This is to be printed in A5 format, and follows the visual and font styles that are also used in Powerpoint presentations, as set out in D8.2. If a consortium member presents a poster at a conference, it is intended that there is a pocket at the side of the poster containing these leaflets so that interested parties can take leaflets away with them. If a consortium member presents a talk, that person can bring these leaflets and distribute them to any interested party.



Figure 1: Leaflet for conferences and other events, front side.



Figure 2: Leaflet for conferences and other events, reverse side

2.2 Leaflet for patients

A leaflet aimed at promoting the project to colonoscopy patients has been prepared. This is to be printed in A4 size, front and back, and is to be folded in half to produce a leaflet A5 in size, giving four pages in total. These are intended for hospitals and surgeries where the doctor or colonoscopist can explain to the patient what the procedure will be, and how it will be beneficial for them. The patient can take this leaflet away and read it in their own time.



Figure 3: Leaflet for patients, back and front of folded leaflet

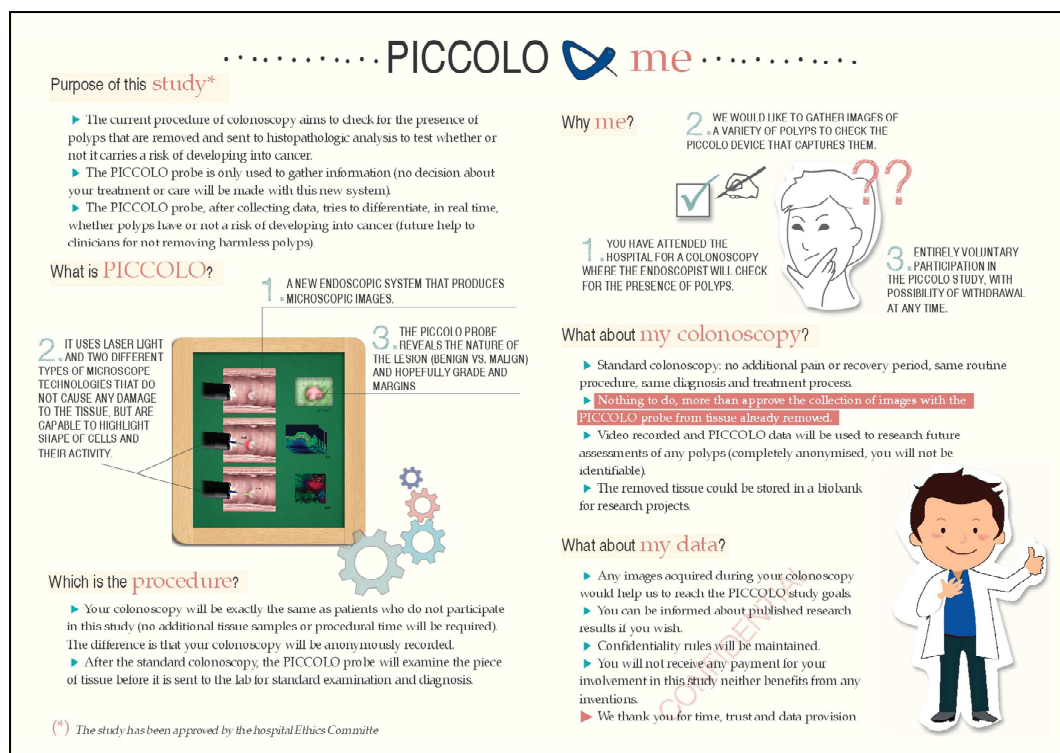


Figure 4: Leaflet for patients, inside left and right pages of folded leaflet

2.3 Leaflet for clinicians

A leaflet aimed at promoting the project to clinicians has been prepared. This is to be printed in A4 size, front and back, and is to be folded in half to produce a leaflet A5 in size, giving four pages in total. These are intended to present the optical technologies combined in the PICCOLO endoscope to clinicians, which would support them for the detection and diagnosis in real time of colorectal polyps during colonoscopy. With this pocket-sized leaflet, clinicians can read at a glance the benefits that the PICCOLO system could provide them in terms of improved detection rate, real time polyp diagnosis and reduction of costs to the patients and healthcare systems.

Key features of the PICCOLO endoscope for clinicians:

- Enhanced imaging functions are available at the touch of a button.
- Adenoma detection rate will be increased.
- Detected polyps can be instantly classified.
- Large polyps can be examined microscopically at the time of endoscopy.
- The photonic techniques do not use ionising radiation.
- The endoscope has similar handling characteristics to existing endoscopes.

PICCOLO will provide vital tools to allow a new approach in polyp detection, diagnosis and treatment. The first prototype was ready in 2019 and validation in clinical settings aim to begin in 2020.



Website: www.piccolo-project.eu
Twitter: @piccolo_eu

This project has received funding from the European Union's Horizon 2020 research and innovation program under Grant Agreement No. 732111.



*This information reflects only the institution's view, so the Agencies and the Commission are not responsible for any use that may be made of the information it contains



PICCOLO

Multimodal highly-sensitive photonics endoscope for improved in-vivo colon cancer diagnosis and clinical decision support

Clinicians leaflet



The continuing drive towards high quality and cost-effective colonoscopy requires effective tools for clinicians to detect, characterize, and treat colorectal polyps. There is growing interest in the acquisition of an "optical biopsy" to allow immediate assessment of colonic lesions.

The PICCOLO endoscope combines advanced imaging modalities and computer-aided diagnosis to support clinicians in real-time detection and diagnosis of colorectal polyps during colonoscopy.

Key elements of the PICCOLO endoscope include:

- Optical Coherence Tomography (OCT) scanning providing high-resolution three-dimensional sub-surface tissue imaging and precise structural information.
- Multi-Photon Tomography (MPT) images, providing structural and functional information at a microscopic level.
- A novel 'red flag' technology for assisted recognition of polyps.

Figure 5: Leaflet for clinicians, back and front of folded leaflet

Benefits of the PICCOLO endoscope:

- **Improved adenoma detection rates (ADR).** Proprietary tissue red flag technology provides a false-colour image of the mucosa during inspection. This enhances the visual contrast between normal and abnormal mucosa, allowing the operator to more easily detect lesions. In particular, small or flat polyps will be more apparent. This works in tandem with the novel alert system, in which computer analysis of the images triggers a visual alert when an area of abnormality is present in the field of view.
- **Characterisation of polyp histology in real-time.** The combined OCT and MPT systems provide real-time images of tissue, at microscopic resolution. This allows the operator to search for subtle sub-surface features suggestive of concerning histology. In future generations of the endoscope this will be combined with automated image analysis to produce a prediction of the tissue histology.
- **Assessment of lesion margins and depth.** The PICCOLO endoscope will also provide valuable tools for the staging of suspected early cancer. Submucosal images will be possible, reducing reliance on mucosal lifting techniques to assess for submucosal invasion.
- A **real-time diagnosis** of small polyps can be achieved without biopsy. Current technological innovations have not produced the expected accuracy to allow 'resect and discard' as a viable strategy; thus, endoscopists and patients will benefit from new approaches that achieve improved diagnostic reliability. This has the potential to reduce procedure times, and reduce exposure to the risks of bleeding or perforation.
- A **rapid reassuring diagnosis** reduces the patient anxiety associated with waiting for biopsy results. Similarly, a timely diagnosis of an invasive lesion allows an earlier start to treatment with associated improvement in prognosis.
- The **red flag** technology decreases the risk of a concerning pathology not being detected.
- The **costs** to patients and to healthcare systems may be greatly **reduced** by pursuing a 'resect and discard' strategy rather than microscopically examining all detected lesions.



Figure 6: Leaflet for clinicians, inside left and right pages of folded leaflet

2.4 Brochure of PICCOLO's results

The very first structure of the brochure describing the exploitable results has been designed aiming to promote PICCOLO's outcomes after the project end. It is a preliminary version whose content and design will be discussed in the next F2F meeting to be held in Cáceres in M37 (January 2020).

It will be printed in A4 format and will be folded in half to produce A5 size sheets. It will follow the visual and font styles used during the PICCOLO project in PowerPoint presentations, deliverable templates and other leaflets previously prepared for *D8.3 Promotional Material*.

The objective of the brochure is to present a brief summary of the PICCOLO project and the main challenges achieved. It is a brochure for collaboration partners, intended to exploit and commercialize the results developed during the project. The main audience will be potential customers of the different technologies as well as the scientific community.

TECNALIA has proposed the following sections for the brochure (to be discussed by all consortium members during the next F2F meeting to be held in Cáceres in M37):

- Front page:
 - Name of the project
 - Logo of PICCOLO
 - Representative picture
 - Project number
 - Logo of EC.

- Introduction:
 - Introduction phrase (“marketing/commercial message”)
 - Brief description of the project
 - Diagram and interlinkage of project results
 - Picture.
- Data sheet for each of the project result:
 - Brief description
 - Features
 - Intended use
 - Advantages
 - Picture(s)
 - Contact person.
- Back page:
 - Logos of consortium partners (placed in a map of Europe or segmented by activity performed in the project)
 - Project Coordinator’s contact
 - PICCOLO’s contact information (webpage, Twitter, LinkedIn, etc.).

An example of the data sheet for the project result “Constellation Loss” is shown below:

CONSTELLATION LOSS

Constellation loss is a function that optimizes a deep learning classifier with very few training images. It goes one step further than other loss functions by simultaneously learning distances among all class combinations. It can attract same class image embeddings whilst pulling apart the rest of the classes, all at the same time. This way, an optimal embedding or descriptor of the image is generated.

FEATURES

- Train a model with few data
- More stable training
- Useful for new image modalities, such as OCT and MPT
- Flexible number of classes. When an embedding lies very far from all the previously learned classes, it can be considered as a new class, it all depends on the problem we are solving

INTENDED USE

- Train OCT and MPT deep classification models
- Extend this to other medical imaging domains

ADVANTAGES

- No need to gather much data
- No need to label the data
- Due to previous advantages, a more time efficient and cheap process of training deep learning models
- It is a parameterizable function, it can be adapted to many distinct problems

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Figure 7: Brochure of PICCOLO’s results, example of description of one result

After the brochure’s design and content is agreed by all consortium members, each partner involved in the results will send the required information to TECNALIA in order to complete the brochure.

TECNALIA has proposed a list of possible project results that could have a data sheet in the brochure:

1. BIOPOOL database
2. Human MPM database
3. Thorlabs OCT database
4. Wide-field database
5. Optical Biopsy Algorithm
6. Constellation Loss Algorithm
7. Polyp Segmentation Algorithm
8. Fiber OCT
9. Fiber MPT
10. Combined Fiber OCT/MPT
11. Hyperplastic rat model
12. MPT laser (Ti:S laser).

All partners of the project will review this preliminary list to modify, add or remove results to/from the brochure.

The brochure draft presented in this deliverable will be completed during the following months, and the following versions will be reported in *D8.12 Plan for the Exploitation and Dissemination of Results (PEDR)* in M39 and in *D9.4 Public Final Report: Final progress report (technical and financial)* and in the *Final project report*, both to be submitted at the end of the project in M42.

2.5 Press releases

In order to promote the project via Internet, three press releases were published during the first year of the project at international, Spanish and Basque media (see sections 2.5.1, 2.5.2 and 2.5.3). Then, several press releases have been published at the project website under the Press & Events section as summarized in section 2.5.4.

2.5.1 International press release for initial project promotion

In order to promote the project in English speaking national and international press, the following press release was released to the media. This is freely available on the project website at <http://www.piccolo-project.eu/publications-presentations/publications/>

New endoscope to target colon tumours

Minimally invasive endoscope using breakthrough photonics technology to enable rapid, accurate diagnosis of bowel polyps and early colon cancer. Funded under Horizon 2020, the EU's research and innovation programme, a European group of scientists are working on the development of an innovative, compact and easy to use endoscopic device, which will play a crucial role in identifying and diagnosing pre-cancerous polyps and early colon cancers. Worldwide, colon cancer remains the third most common cancer in men, behind lung and prostate cancer, and second in women, behind breast cancer. Colorectal cancer ranks as one of the world's most predominant cancers, affecting

approximately one in ten people during their life and causing almost 700,000 annual deaths globally. Almost 95% of these cases are adenocarcinomas, which typically start as a growth of tissue called a polyp. Today, the main method to achieve early detection of the disease is colonoscopy. While up to 40% of the patients under routine analysis colonoscopy present one or more polyps, almost 30% of these polyps are not detected, especially in the case of flat polyps. Of those detected, 29-42% are generally hyperplastic, and will not develop into cancer. The remainder are neoplastic polyps, which are of primary importance because they harbor malignant potential and represent a stage in the development of colorectal cancer. For this reason, it is essential to identify these polyps at an early stage. Speaking about the PICCOLO Project Dr. Artzai Picon (Tecnalia) said “We hope that PICCOLO will provide major benefits over traditional colonoscopy. Firstly, by developing an advanced endoscope, using both Optical Coherence Tomography (OCT) & Multi-Photon Tomography (MPT), we will provide high-resolution structural and functional imaging, giving details of the changes occurring at the cellular level comparable to those obtained using traditional histological techniques. Furthermore, when multiple polyps are detected in a patient, the current gold standard procedure is to remove all of them, followed by microscopic tissue analysis. Removal of hyperplastic polyps, which carry no malignant potential, and the subsequent costly histopathological analysis might be avoided through the use of the PICCOLO endoscope probe, which could allow image-based diagnosis without the need for tissue biopsies”. The long term potential for this project is exciting. Not only will it provide a new approach in colon cancer detection, but the new image based diagnosis methods could be applied to diseases in other organs of the body. The PICCOLO team hope to have refined their first prototype by the end of 2018 and targets clinical trials to begin around 2020.

This was picked up at many outlets, which will be listed in the next version of D8.1.

2.5.2 Spanish press release for initial project promotion

A press release was also prepared in Spanish and was released to Spanish media.

Un endoscopio fotónico para la mejora del diagnóstico del cáncer de colon

El Centro de Cirugía de mínima Invasión Jesús Usón (CCMIJU) ha asistido, durante los días 18 y 19 de enero, a la reunión de lanzamiento y puesta en marcha del proyecto europeo “Multimodal highly-sensitive PhotonICS endoscope for improved in-vivo COLON Cancer diagnosis and clinical decision support” (PICCOLO, por sus siglas en inglés), que se ha celebrado en Bilbao.

Dicho proyecto tiene como objetivo desarrollar un endoscopio fotónico compacto, híbrido y multimodal basado en tomografía de coherencia óptica y multifotónica, combinado con fluorescencia. El cáncer colorrectal representa alrededor de un 10% de todos los cánceres del mundo, por tanto un diagnóstico temprano y preciso puede aumentar su curación hasta en un 90% de los casos.

Un equipo multidisciplinar europeo, formado por la Fundación Tecnalia, líder del proyecto, y otros ocho socios europeos procedentes de Italia, Reino Unido, Irlanda, Alemania y España, entre ellos el CCMIJU, se han unido para llevar a cabo este ambicioso proyecto europeo, financiado por el

programa Horizonte 2020 de la Unión Europea. PICCOLO persigue desarrollar un endoscopio innovador para proporcionar a los gastroenterólogos una identificación in situ, inmediata y detallada de las lesiones neoplásicas y facilitar diagnósticos precisos y fiables.

Todo ello redundará, como indica el Dr. Sánchez Margallo, investigador principal y Director Científico del CCMIJU, en la mejora de la calidad de vida de los pacientes, pues este proyecto incluye toda la cadena de valor, con socios preclínicos (la institución cacereña) y clínicos, proveedores de tecnología, PYMEs fotónicas y empresa líder en el mercado de endoscopia.



Este proyecto ha sido financiado por el programa de investigación e innovación de Horizonte 2020 de la Unión Europea con número 732111.

Esta información refleja el punto de vista de la institución, por tanto se exime a la Comisión europea y/o a sus Agencias de la responsabilidad del uso que se haga de la información aquí contenida.

This press release was also picked up at many Spanish outlets, and will be listed in the next submission of D8.1.

2.5.3 Basque press release for initial project promotion

The following press release was published in Basque media in November 2017 both in Spanish (text included here) and Basque languages.

EUSKADI INVESTIGA UN NUEVO ENDOSCOPIO QUE MEJORARÁ EL DIAGNÓSTICO DEL CÁNCER DE COLON Y RECTO

- El Hospital Universitario Basurto participa en el proyecto PICCOLO dirigido por Tecnia cuyo objetivo es desarrollar un endoscopio que permita un diagnóstico temprano del cáncer colorrectal mediante técnicas avanzadas de toma de imágenes de la lesión
- Sin necesidad de tomar biopsias o extirpar el pólipo, el endoscopio ayudará a determinar en tiempo real si un pólipo es benigno, pre-maligno o si ya ha evolucionado a cáncer ("biopsia óptica")
- Permitirá un diagnóstico seguro y preciso sin causar daño al paciente
- El Gobierno Vasco trabaja por lograr un diagnóstico seguro y precoz del cáncer. El Programa de Detección Precoz de Cáncer Colorrectal de Osakidetza es ya reconocido como **uno de los mejores programas poblacionales preventivos de cáncer colorrectal del Estado y a nivel internacional**

El cáncer colorrectal es el tipo de cáncer más frecuente en la CAPV si se consideran ambos sexos en conjunto. La mortalidad asociada es alta si se detecta en una fase avanzada. La mayoría de los cánceres se desarrollan a partir del lento crecimiento de lesiones premalignas como algunos pólipos y representa alrededor de una décima parte de todos los casos de cáncer a nivel mundial.

El Departamento de Salud del Gobierno Vasco trabaja por lograr un diagnóstico temprano y riguroso y una intervención de precisión ya que así se puede aumentar la tasa de cura a un 90%. En este sentido, el Programa de Detección Precoz de Cáncer Colorrectal de Osakidetza completó este mes de marzo la invitación al 100% de las personas en segunda vuelta y constituye uno de los mejores programas poblacionales preventivos de cáncer colorrectal del Estado y también a nivel internacional en términos de cobertura, calidad y participación. **Las personas entre 50 y 69 años es el grupo de población** al que va dirigido. A finales de este año habrá conseguido haber invitado al 80% de las personas por tercera ronda.

La lucha contra el cáncer de colon requiere de técnicas de diagnóstico mejoradas con suficiente precisión que permitan una evaluación de la lesión de forma rápida, precisa e in situ, así como la extirpación de lesiones durante las intervenciones de la práctica clínica. La eficacia en la prevención del cáncer colorrectal depende de la identificación y de la extirpación completa de todas las lesiones pre-malignas. La colonoscopia es la prueba principal utilizada, pero hasta el 30% de los pólipos pueden escapar a su detección. Por otro lado el 29-42% de los pólipos identificados no son pre-malignos y no derivarán en cáncer, pero actualmente no es posible diferenciarlos con confianza de los que sí lo son.

En este contexto, Euskadi está trabajando en un proyecto de investigación que proporcionará un avance sobre la colonoscopia que actualmente se realiza en la práctica asistencial. El proyecto se llama PICCOLO y se desarrolla a través de un consorcio europeo formado por los Servicios de Digestivo y Anatomía Patológica del Hospital Universitario Basurto con el apoyo del Biobanco Vasco de la Fundación Vasca de Innovación e Investigación Sanitarias-BIOEF (instrumento creado por el Departamento de Salud para promover la innovación y la investigación en el sistema sanitario de Euskadi) y coordinado por el centro de investigación y desarrollo tecnológico Tecnia, coordinadores del proyecto. En este proyecto, financiado por la Comisión Europea con 4 millones de euros y que durará 36 meses, participan 9 socios más del Estado, Italia, Irlanda, Alemania e Inglaterra.

Se espera que PICCOLO proporcione un avance sobre la colonoscopia que actualmente se realiza en la práctica asistencial. Cuando se detectan múltiples pólipos en un paciente, el procedimiento estándar actual es eliminar todos ellos y realizar posteriormente, un análisis microscópico del tejido.

El proyecto busca desarrollar un endoscopio que utilice técnicas de diagnóstico avanzado in situ durante la endoscopia, a través de toma de imágenes que analicen con precisión cómo es la estructura de la lesión y cómo funciona y se desarrolla. Asimismo, el endoscopio permitirá la detección automática de lesiones sutiles que se suelen escapar (como lesiones de morfología plana y aspecto similar a la mucosa normal del colon) gracias al uso de fluorescencia en una colonoscopia con imagen de alta resolución.

El objetivo final será desarrollar un nuevo colonoscopio que permitiría a los y las profesionales del sistema sanitario conocer mejor el diagnóstico de la lesión sin necesidad de tomar biopsias o extirpar el pólipo, diferenciar en tiempo real si este es benigno, pre-maligno o si ya ha degenerado a cáncer ("biopsia óptica"). Además podrá ayudar en la extirpación completa de los pólipos al permitir una mejor evaluación de sus márgenes de la forma y composición. En un futuro el objetivo posterior será aplicar esta tecnología para el diagnóstico de enfermedades en otros órganos

PICCOLO utilizará en una primera fase modelos animales representativos de humanos para generar biomarcadores de imagen que permitan una detección y caracterización. Se espera tener el primer prototipo para finales del 2017 y apunta hacia el año 2020 para que comience su comercialización.

La extirpación innecesaria de estos pólipos no malignos conlleva un aumento del riesgo para los pacientes (sangrados, perforación), una mayor duración de la colonoscopia, así como un aumento en la carga de trabajo para el Servicio de Anatomopatología y mayores costes. Por esta razón, es esencial identificar los pólipos malignos en una fase temprana y PICCOLO aportará importantes avances en este campo.

2.5.4 Press releases published at the project website

Several press releases have been published under the Press & Events section of the PICCOLO project website (<https://www.piccolo-project.eu/news/>). Besides the press releases about the different project face-to-face meetings, the following press releases of general public interest have been published:

1. Experimental work at OSI Bilbao-Basurto (released in July 2018)

The experimental work of the PICCOLO Project has already started in the Gastroenterology and Pathological Anatomy Services at the OSI Bilbao-Basurto.

The OSI Bilbao-Basurto (Osakidetza/BIOEF) has started the collection of routine colonoscopy videos to work on image analysis and processing in order to achieve the project objectives. (...)

2. Set-up of the project prototype (released in December 2018)

During the last week of November, Light4Tech, LENS, Tyndall, M2Lasers and Tecnalía have been working together at CCMIJU (Cáceres, Spain) on the set-up of the PICCOLO prototype. The prototype integrates MPT and OCT optical and electronic components driven by a dedicated computer that controls image acquisition and the endoscopy probe.

The prototype has been integrated in a cart from KARL STORZ and placed in the operating room. Animal testing using the prototype will start soon at CCMIJU.

3. Multi-photon technology (released in February 2019)

Sprite XT is a flexible ultrafast, femtosecond laser source designed to deliver stability, reliability and productivity for its users. All Sprite models are alignment- and maintenance-free and are controlled either from a web browser or through a set of TCP/IP controls. The flexibility of the control interface allows for easy integration with larger systems, for example, the PICCOLO MPT system, with minimum adaptation.

Sprite XT has exceptional power, beam and pulse stability with amplitude noise less than 0.1%. The laser auto-aligns once or twice a day, addressing the needs of clinicians using the MPT system for diagnostic appointments well. Furthermore, Sprite XT is less than half the size of comparable laser systems and offers an optimised footprint with integrated pump.

4. Clinical Workshop for gastroenterologists in Cáceres (released in June 2019)

The Jesús Usón Minimally Invasive Surgery Centre (JUMISC) has performed a clinical workshop to present the PICCOLO Project to gastroenterologists attending the training event "Hands-on Course on Digestive Endoscopy" held on 27th and 28th of this month in its facilities.

It has been shown the PICCOLO project with a video: a brief introduction of colorectal cancer, objectives of the project, role of JUMISC, and the benefits for clinicians, patients, corporations and health systems.

After watching it, attendants were asked to fill in a survey, prepared to get relevant info and feedback from end-users about the PICCOLO project, as well as the technologies and procedure currently used for the colorectal cancer diagnosis.

21 gastroenterologists attended this clinical workshop and filled in the survey.

5. Towards an efficient use of biological datasets with deep learning (released in July 2019)

Last April 8th-11th took place the IEEE International Symposium on Biomedical Imaging (ISBI), a scientific conference dedicated to mathematical, algorithmic, and computational aspects of biological and biomedical imaging, across all scales of observation. The member of PICCOLO team and Tecnalia Research & Innovation, Alfonso Medela, presented the paper "Few-shot learning in histopathological images: reducing the need of labelled data on biological datasets".

The team has been working on a few-shot approach in parallel with the acquisition of the datasets. (...)

6. Preclinical study on fluorescence imaging with KARL STORZ equipment at CCMIJU (released in August 2019)

A further preclinical trial has been completed on the fluorescence imaging based red flag approach that the PICCOLO consortium is currently working on. The preclinical study was performed at CCMIJU, Cáceres (Spain) in cooperation with KARL STORZ SE & Co. KG.

The results will be the basis for a further refinement of the next prototype. The PICCOLO consortium is looking forward to the second prototype generation which will be validated in another preclinical trial in the autumn for MPT and OCT at CCMIJU.

7. 2nd Clinical Workshop at CCMIJU to present the project (released in September 2019)

A team of the Jesús Usón Minimally Invasive Surgery Centre (JUMISC) has performed the second clinical workshop to present the PICCOLO Project to gastroenterologists attending the training event "Course of Endoscopic Retrograde Cholangiopancreatography" held on 19th and 20th of this month in its facilities.

It has been shown the PICCOLO project with a video: a brief introduction of colorectal cancer, objectives of the project, role of JUMISC, and the benefits for clinicians, patients, corporations and health systems.

After watching it, attendants were asked to fill in a survey, prepared to get relevant info and feedback from end-users about the PICCOLO project, as well as the technologies and procedure currently used for the colorectal cancer diagnosis.

10 gastroenterologists attended this clinical workshop and filled in the survey.

8. Clinical Workshop for expert gastroenterologists at CCMIJU (released in October 2019)

The Jesús Usón Minimally Invasive Surgery Centre (JUMISC) has performed the third clinical workshop in the frame of the course entitled “Endoscopic Submucosal Dissection in Animal Model”, where 15 expert gastroenterologists participated. They watched a video on PICCOLO project, containing a brief introduction about colorectal cancer, objectives of the project, role of JUMISC, and the benefits for clinicians, patients, corporations and health systems.

Afterwards, attendants were asked to fill in a survey, prepared to get relevant info and feedback from end-users about the PICCOLO project, as well as the technologies and procedure currently used for the colorectal cancer diagnosis.

It was held on 4th and 5th of this month in its facilities.

9. Constellation loss (released in November 2019)

Deep learning diagnostic algorithms are proving comparable results with human experts in a wide variety of tasks, they still require a huge amount of well annotated data for training which is often non-affordable.

Metric learning techniques have allowed a reduction on the required annotated data allowing few-shot learning. Existing deep metric learning loss functions have made possible generating models capable of tackling complex scenarios with the presence of many classes and scarcity on the number of images per class, not only work for classification tasks, but to many other clinical applications where measuring similarity is the key.

Currently used state-of-the-art loss functions still suffer from slow convergence due to the selection of effective training samples that has been partially solved by the multi-class N-pair loss by simultaneously adding additional samples from the different classes.

The constellation loss goes one step further (...)

From the delivery date of this document to the end of the project, more technical press releases of general public interest are expected to be published on the project website.

2.6 PICCOLO project Twitter

A Twitter account ([@piccolo_eu](https://twitter.com/piccolo_eu)) has been created for PICCOLO project dissemination (https://twitter.com/piccolo_eu). All the announcements, meetings, conferences, presentations, technical updates, clinical updates and prototype tests related to the project have been published. Besides, other interesting Twitter entries related to the project technologies and objectives have been re-tweeted, and several technical Twitter accounts are followed.

The next figure shows the PICCOLO Twitter statistics at the end of November 2019:



Figure 8: Screenshot of PICCOLO project Twitter site

More figures are included showing some of the more relevant PICCOLO Twitter entries.



Figure 9: Generation of the RGB/NBI clinical colonoscopy video database



Figure 10: Project presentation at the SEIQ2018 congress

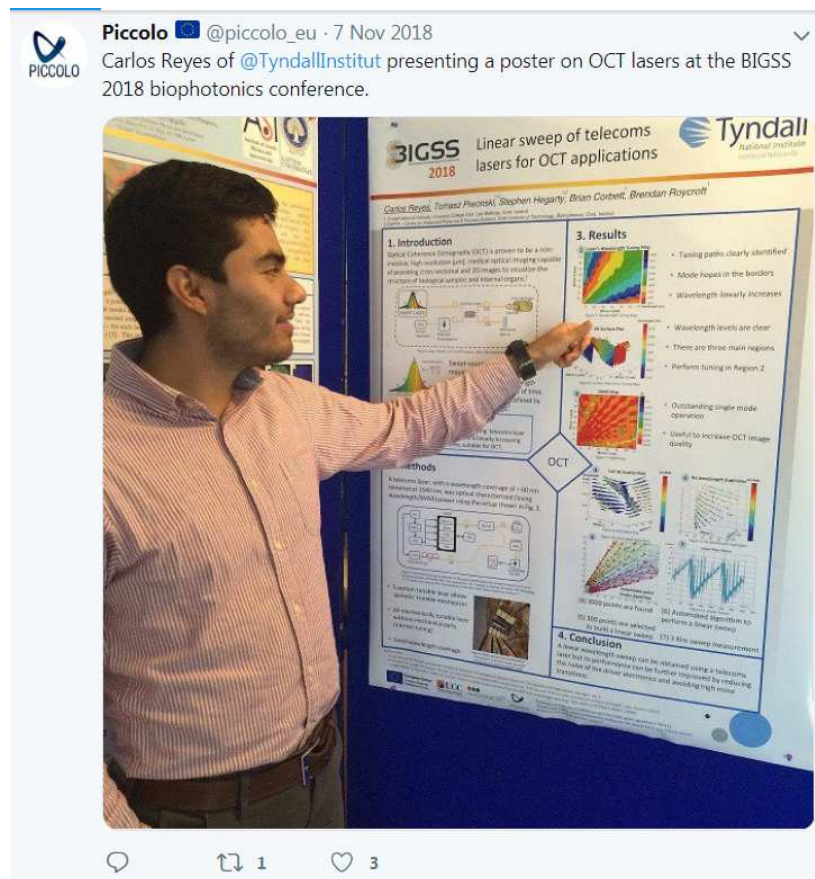


Figure 11: Poster presentation on OCT lasers at the BIGSS 2018 conference



Figure 12: Oral communication and poster presented at the CASEIB 2018 congress



Figure 13: Fluorescence tests at CCMIJU's facilities



Figure 14: First prototype setup at CCMIJU's facilities in Cáceres



Figure 15: Promotional tweet about PICCOLO aims



Figure 16: Presentation of the paper about few-shot learning algorithms at the ISBI 2019 conference



Figure 17: Project presentation at the 6th training sessions in OSI Bilbao-Basurto



Figure 18: Tweet after the fluorescence tests in July 2019



Figure 19: Article about PICCOLO published on the supplement of the El Mundo newspaper

2.7 Other dissemination activities

In some institutions, as at the CCMIJU, they have performed the following dissemination activities, distributed by years.

In 2017:

- Presentation of PICCOLO project to 1.321 students coming from 28 institutions of Extremadura region (mainly secondary schools and associations).
- 2 forums: “Challenges in Ovarian Cancer” on April 6th, 2017 and “I meeting on Oncofertility” on May 4th, 2017.
- 1 oral communication at 25th International Congress of the European Association for Endoscopic Surgery (E.A.E.S.). Title: “A MULTIMODAL PHOTONIC ENDOSCOPE TO IMPROVE IN VIVO COLON CANCER DIAGNOSIS AND CLINICAL DECISION SUPPORT”, Authors: Francisco Miguel Sánchez Margallo, Juan Francisco Ortega Morán, Cristina L. Saratxaga, Peter Solleder, Domenico Alfieri, Brendan Roycroft, James Bain, Francesco S. Pavone, Riccardo Cicchi, Julian Teare, Francisco Polo, Nagore Arbide, Jaime Velasco, Artzai Picon. Frankfurt am Main (Germany), June 14th-17th, 2017.
- 1 oral communication at XXIII Congreso de la Sociedad Española de Investigaciones Quirúrgicas (SEIQ). Title: “IS IT NECESSARY TO IMPROVE THE COLORECTAL POLYPS

DATABASES FOR DETECTION CAD SYSTEMS BASED ON DEEP LEARNING?" Authors: L.F. Sánchez-Peralta¹, F.M. Sánchez Margallo¹, J. Bote Chacón¹, F. Soria Gálvez¹, C.L. Saratxaga², A. Picón Ruiz², J. B. Pagador¹. (1 Jesús Usón Minimally Invasive Surgery Centre, Cáceres, Spain, 2 Fundación Tecnalia Research & Innovation, Derio, Spain.) Madrid (Spain), November 16th-17th, 2017.

- 2 conferences and Science Week dissemination. Conference by José Blas Pagador Carrasco on November 14th, 2017 and by M^a Resurrección López Lozano on October 16th, 2017 on the occasion of the Science Week in Extremadura. They were held at CCMIJU's facilities in Cáceres (Spain), in auditoriums and operating rooms.

In 2018:

- Presentation of PICCOLO project to 1.512 students coming from 35 institutions of Extremadura region (mainly secondary schools and associations).
- Women and girls science day. Conference on "The communication in a research centre" at the Donoso Cortés School in Cáceres (Spain), presented by M^a Resurrección López Lozano, Communication Manager. PICCOLO project was explained to primary school students. February 1st, 2018.
- International womens day. Conference on "The communication in a research centre" at the Delicias School in Cáceres (Spain), presented by M^a Resurrección López Lozano, Communication Manager. PICCOLO project was explained to primary school students. March 7th, 2018.
- Conference about PICCOLO project presented by José Blas Pagador Carrasco at Ateneo, Cáceres (Spain) with 32 assistants. April 25th, 2018.
- A working meeting about CCMIJU's projects with the Major of Cáceres and town councilors. Cáceres (Spain), May 31st, 2018.
- Poster presented to the European Association for Endoscopic Surgery (EAES). Title: "MEDICAL NEEDS IN CURRENT COLONOSCOPY PROCEDURES OF COLORECTAL CANCER DIAGNOSIS." Authors: Francisco Miguel Sánchez Margallo¹, Juan Francisco Ortega Morán¹, J. Blas Pagador¹, Ben Glover², Julian Teare², Angel José Calderón³, Maria del Carmen Etxezarraga³, Cristina L. Saratxaga⁴, Artzai Picon⁴ (1 Centro de Cirugía de Mínima Invasión Jesús Usón, Cáceres, Spain, 2 Imperial College of Science, Technology and Medicine, London, United Kingdom, 3 Hospital Universitario de Basurto, Bilbao, Spain/Fundación Vasca de Investigaciones e Innovación Sanitaria, Barakaldo, Spain, 4 Fundación Tecnalia Research & Innovation, Derio, Spain.). London (Great Britain), May 30th and June 1st, 2018.
- Poster presented to the Spanish Society of Surgical Research Congress (SEIQ). Title: "SYSTEMATIC ACQUISITION AND ANNOTATION OF CLINICAL CASES FOR THE GENERATION OF A MEDICAL IMAGE DATABASE." Authors: Luisa F. Sánchez-Peralta¹, Ángel José Calderón², Virginia Cabezón³, Juan Francisco Ortega-Morán¹, Francisco M. Sánchez-Margallo¹, Francisco Polo², Cristina L. Saratxaga⁴, Artzai Picón⁴ (1 Centro de Cirugía de Mínima Invasión Jesús Usón, Cáceres, Spain, 2 OSI Bilbao-Basurto (Hospital Universitario de Basurto), Bilbao, Spain, 3 Biobanco Vasco, Fundación Vasca de Innovación e Investigación Sanitarias (BIOEF), Barakaldo, Spain, 4 Fundación Tecnalia Research & Innovation, Derio, Spain.). Bilbao (Spain), October 18th and 19th, 2018.

- Oral Communication presented to the Spanish Society of Biomedical Engineering Annual Meeting (CASEIB). Title: “Innovative multiphotonic endoscope to address technological challenges in current colonoscopy procedure” Authors: L. Bote-Curiel, JF. Ortega Morán, JB. Pagador, FM. Sánchez Margallo, B. Glover, J. Teare, F. Polo, N. Arbide, C.L. Saratzaga, P. Solleder, D. Alfieri, F. di Noia, B. Roycroft, J. Bain, R. Cicchi, FS. Pavone, A. Picon. Ciudad Real (Spain). November 21st - 23rd, 2018.
- Poster presented to the Spanish Society of Biomedical Engineering Annual Meeting (CASEIB). Title: “AUTOMATIC SEGMENTATION OF COLORECTAL POLYPS USING DEEP LEARNING” Authors: L.F. Sánchez-Peralta¹, L. Bote-Curiel¹, J.B. Pagador¹, J.F. Ortega-Morán¹, F.M. Sánchez-Margallo¹, A. Picón Ruiz² (1 Jesús Usón Minimally Invasive Surgery Centre, Cáceres, Spain {lfsanchez, lbote, jbpagador, msanchez}@ccmijesususon.com, 2 Tecnalia Research & Innovation, Derio, Spain, artzai.picon@tecnalia.com.). Ciudad Real (Spain), November 21st - 23rd, 2018.
- Two posters presented at the III Annual World Preclinical Congress. Lisbon (Portugal), November 27th - 30th, 2018.
 - 1) Title: “FEASIBILITY COMBINED WITH DIAGNOSTIC TECHNIQUES OF COLORECTAL CANCER SUCH AS ENDOSCOPY, SOLID BIOPSIES AND LIQUID BIOPSIES IN A MURINE MODEL.” Authors: Bote-Chacón J., Moreno Lobato B, Ortega Morán JF, Guillén Caro JF, Sánchez Margallo FM.
 - 2) Title: “PRE-CLINICAL STAGE TO DEVELOP A MULTIMODAL HIGHLY-SENSITIVE PHOTONICS ENDOSCOPE FOR IMPROVED IN-VIVO COLON CANCER DIAGNOSIS AND CLINICAL DECISION SUPPORT” Authors: Guillén Caro JF, Bote-Chacón J., Ortega Morán JF, Pagador Carrasco JB, Sánchez Margallo FM.

In 2019:

- Presentation of PICCOLO project to 1.115 students coming from 31 institutions of Extremadura region (mainly secondary schools and associations).
- Poster presented at the XXVII International Congress of the European Association of Endoscopic Surgery (EAES). Title: “PILOT STUDY FOR THE CHARACTERIZATION OF A MURINE MODEL OF HYPERPLASTIC GROWTH COLON.” Authors: Bote Chacón J, Moreno Lobato B, Sánchez Margallo FM. Sevilla (Spain), June 12th – 15th, 2019.
- Oral Communication on Gastroenterologists’ perceptions about a new multimodal photonics endoscope for in-vivo colorectal cancer diagnosis, presented at SMIT 2019.
- Title: “Gastroenterologists’ perceptions about a new multimodal photonics endoscope for in-vivo colorectal cancer diagnosis.” Authors: J.F. Ortega-Morán, J. Bote, B. Pagador, M.R. López-Lozano, F. Soria, J. González-Sánchez, F.M. Sánchez-Margallo. Heilbronn (Germany), October 10th - 11th 2019.
- Oral communication presented at the SEIQ (Spanish Society for Surgical Researchs), Title: “DO GASTROENTEROLOGISTS FULLY RELY ON NEW PHOTONICS TECHNOLOGIES FOR THE DIAGNOSIS OF COLORECTAL CANCER?” Authors: J.F. Ortega-Morán, J. Bote, B. Pagador, M.R. López-Lozano, F. Soria, J. González-Sánchez, F.M. Sánchez-Margallo. Barcelona (Spain), December 12th and 13th, 2019.
- A new video in Spanish-English language about the CCMIJU’s activities is shown on in situ:
 - Hands-on Course on Digestive Endoscopy, held on June 27th and 28th, 2019, addressed to gastroenterologists.

- Course of Endoscopic Retrograde Cholangiopancreatography on September 19th and 20th, 2019, addressed to gastroenterologists.
 - Course on Endoscopic Submucosal Dissection in Animal Model on October 4th and 5th, 2019, addressed to gastroenterologists.
 - Professors visit coming from several Spanish universities on October 20th, 2019.
- Report on November 4th, 2019. Recording images and interviews on PICCOLO project for a written supplement on the El Mundo journal. Impact: El Mundo Journal, November 9th, 2019. Written edition.

3. Conclusion

In this document, produced in Month 36 of the PICCOLO project, all public dissemination activities and promotional material that has been generated throughout the project is listed.

Three leaflets were created that help to inform the patient and clinician about the PICCOLO project. Another leaflet addresses conference and other events participants about the aim of the PICCOLO project. The ongoing final brochure will be addressed to collaboration partners and the scientific community as potential clients or end users of the technologies developed in the project.

In addition, throughout the project the public was informed on the website <http://www.piccolo-project.eu/> in the press & events section, by the tweets on the Twitter account https://twitter.com/piccolo_eu of the project activities, described in D8.2, by public presentations on scientific conferences and by public press releases in the news. Initial press releases were published in English, Spanish and Basque. A full overview of the activities is given in Table 1.

Table 1: Promotional material overview

Promotional Material / Activity	Audience/Topic
Leaflet	for conferences and other events
	to inform patients
	to inform clinicians
	to inform industry, collaboration partners and scientific community
Twitter	PICCOLO Project presentation
	Generation of the RGB/NBI clinical colonoscopy video database
	Tweet on fluorescence tests
	Fluorescence tests at CCMIJU's facilities
	First prototype setup at CCMIJU's facilities in Cáceres
	Promotional tweet about PICCOLO aims
Scientific presentation	Talk at SEIQ congress in 2017, 2018, 2019
	Talk at EAES congress in 2017, 2018, 2019
	Poster at BIGSS 2018 conference
	Posters at WPC 2018
	Talk and posters at CASEIB 2018 congress
	Talk at ISBI 2019 conference
	Talk at 6th training sessions in OSI Bilbao-Basurto
	Various conferences at CCMIJU in 2017 and 2018
	Presentations to students in 2017, 2018, 2019
News	Article on PICCOLO at El Mundo newspaper
Press releases (general public interest)	Experimental work at OSI Bilbao-Basurto (released in July 2018)
	Set-up of the project prototype (released in December 2018)
	Multi-photon technology (released in February 2019)
	Clinical Workshop for gastroenterologists in Cáceres (released in June 2019)

	Towards an efficient use of biological datasets with deep learning (released in July 2019)
	Preclinical study on fluorescence imaging with KARL STORZ equipment at CCMIJU (released in August 2019)
	2nd Clinical Workshop at CCMIJU to present the project (released in September 2019)
	Clinical Workshop for expert gastroenterologists at CCMIJU (released in October 2019)
	Constellation loss (released in November 2019)
Videos	Video in Spanish-English shown at various events at CCMIJU
Other events	Science week, health forums, international women's day, girls science days, working meetings

The dissemination activities and outcomes reflect the PICCOLO project aim and do serve for further information on the projects progress and final closure in June 2020.